VOL. XV. No. 7.
JULY 1930

MECCANO MAGAZINE

THRILLS WITH THE ROCK CLIMBERS
(see page 514.)

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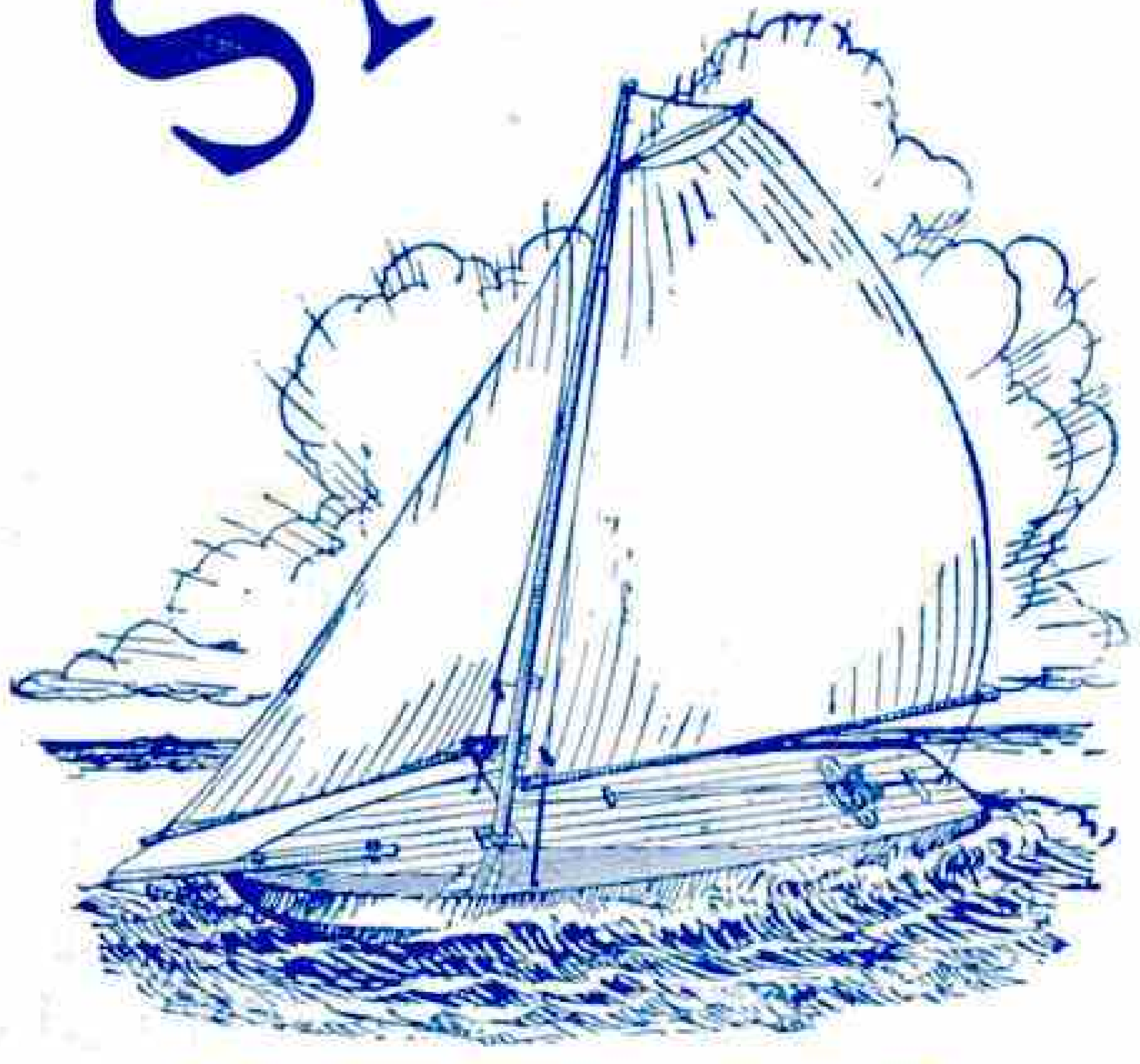

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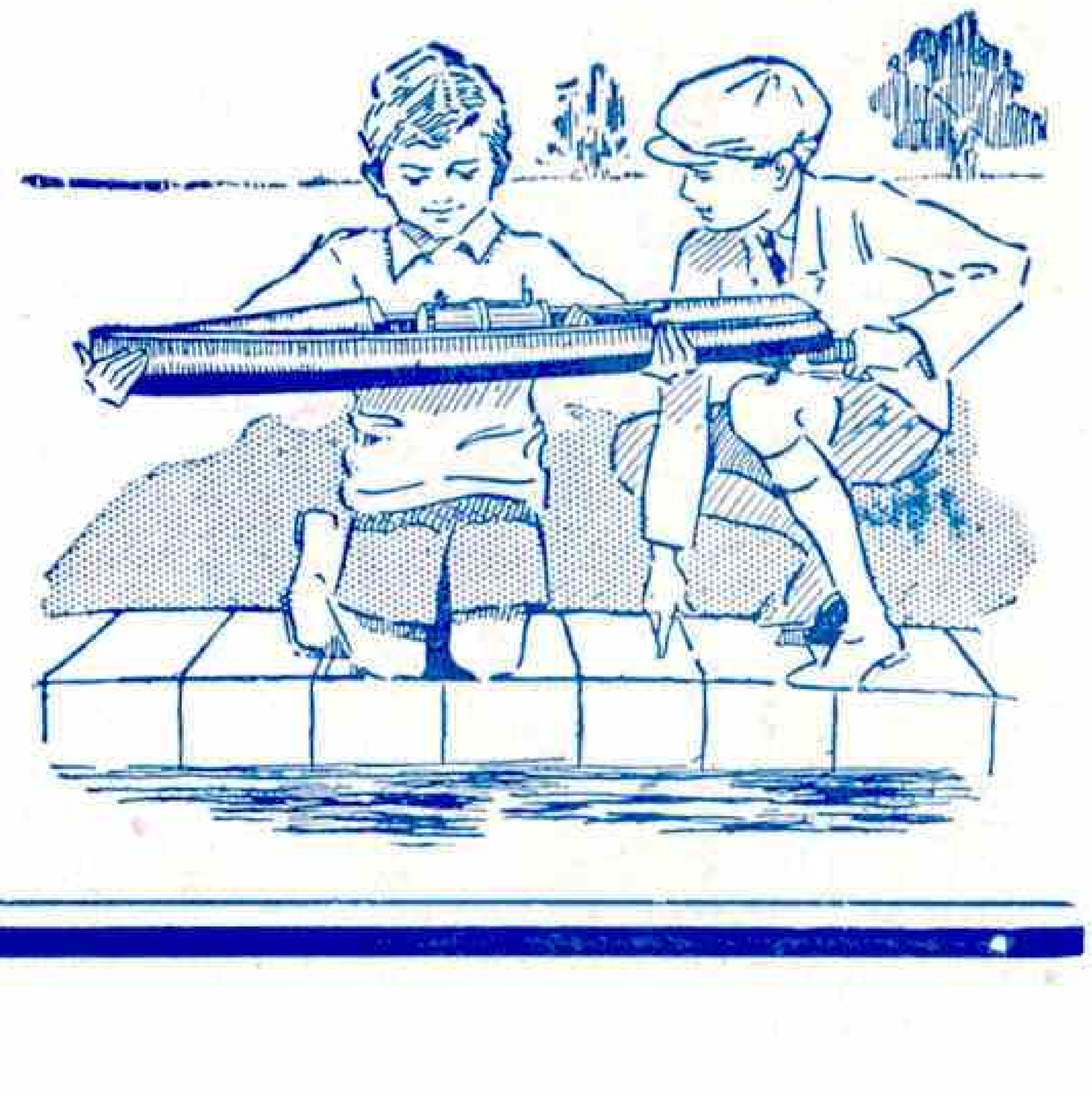

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Vol. XV. No. 7
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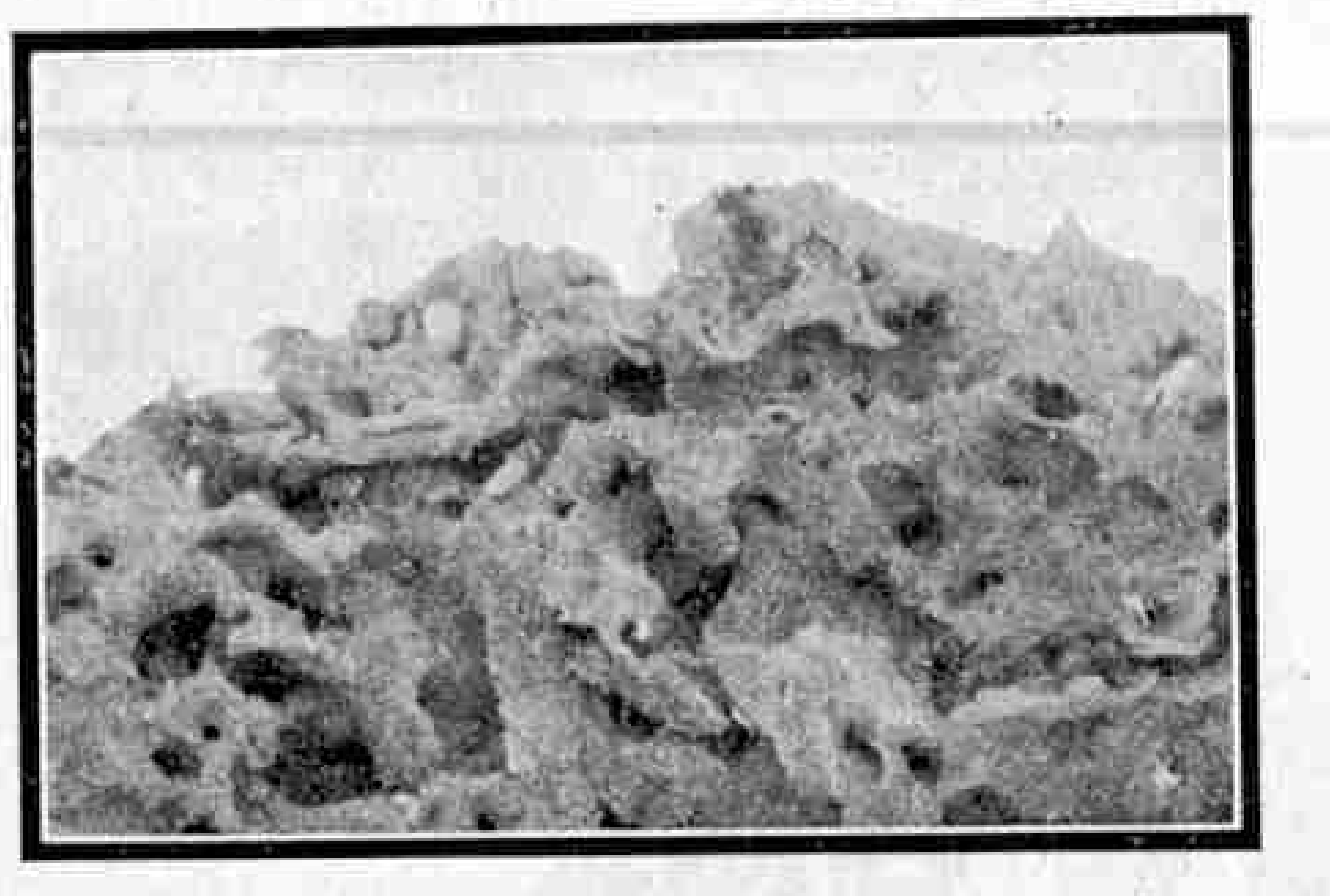
With the Editor

Sir Henry Segrave

All readers of the "*M.M.*" would learn with deep regret of the death of Sir Henry Segrave during a successful attempt to beat the world's speed record on water. For some years Sir Henry has been an outstanding figure in the world of speed. He was educated at Eton and Sandhurst and received a commission in the Army in 1914, subsequently transferring to the Royal Air Force. After demobilisation he turned his attention to motor racing, and soon gained the reputation of being one of the best drivers in the world. His great ambition was to attain a speed of 200 m.p.h., and in 1927 he succeeded in doing this at Daytona Beach, Florida, when he set up a record of 203.8 m.p.h. In the following year this record was beaten twice, first by Captain Malcolm Campbell with 206.356 m.p.h., and afterwards by Mr. Ray Keech, an American, with 207.5 m.p.h. In 1929 Sir Henry once more journeyed to Daytona, taking with him his famous car "*Golden Arrow*," and this time he raised the record to 231.362 m.p.h., at which it still stands. Later in the same year Squadron Leader Orlebar gained for Britain the world's speed record for air, 357.7 m.p.h., and Sir Henry determined to make the series complete by winning also the water record, then held by an American, Mr. Gar Wood, with 93.123 m.p.h.

No. 20. WHAT EVER IS IT?



Here is the twentieth puzzle in the popular series of mystery photographs. Can you identify this mysterious looking object?

To the first reader to send an exact answer or, if nobody is successful in this, to the one who gets nearest I will send an autographed copy of my book "Wonders of Engineering."

Solutions should be written on postcards only and addressed "Editorial Competition, No. 20, 'Meccano Magazine,' Old Swan, Liverpool." Closing date 31st July. For result of June Contest see page 592.

A new boat, "*Miss England II*," was built specially for the purpose, and Sir Henry commenced preliminary trials last month on Lake Windermere. He experienced a remarkable series of minor mishaps—propellers failed, and something seemed to go wrong almost every time he brought out the boat. Then on Friday, 13th June, his luck seemed to change and everything went well. "*Miss England II*" completed the first mile in 43 seconds, equal to a speed of 96.41 m.p.h., and the second mile in 41 seconds or 101.11 m.p.h.; the mean speed, 98.76 m.p.h., constituting the new record. Sir Henry then commenced the second circuit, and almost immediately disaster occurred. The boat, which was estimated to be travelling at a speed of 119.8 m.p.h., leaped out of the water and overturned. Several motor boats rushed to the rescue and Sir Henry and his engineer, Mr. M. J. Willcocks, were rescued but the mechanic, Mr. A. V. Halliwell, was drowned. Sir Henry was conscious when he was taken from the water, and although he was in great agony his thoughts were all on the record. "Have I beaten the record?" was his first question, and he was told that he had done so and by how much. Not long afterwards he died.

On an occasion of this nature the first question that occurs to us must always be: "Is it worth it?" The price of this latest record is a terrible one, and it has produced in certain quarters an outcry that speed attempts of this kind are useless and should cease. It seems to me that these people are looking at the matter from a wrong point of view. It may seem a small thing to add a mile or two per hour to a record, but all such attempts are based upon the endeavour to push backward the confining limits of possibility. As the Coroner said, at the inquest on the gallant "speed-king," we have to remember that this gentleman and his engineer, who unfortunately also lost his life, were not out for personal gain or aggrandisement—they were out to uphold what Britain stands for, for something to be gained in prestige by Britain. The spirit that animated Sir Henry Segrave is the same that has inspired the pioneers and leaders of men throughout history.

War and Peace

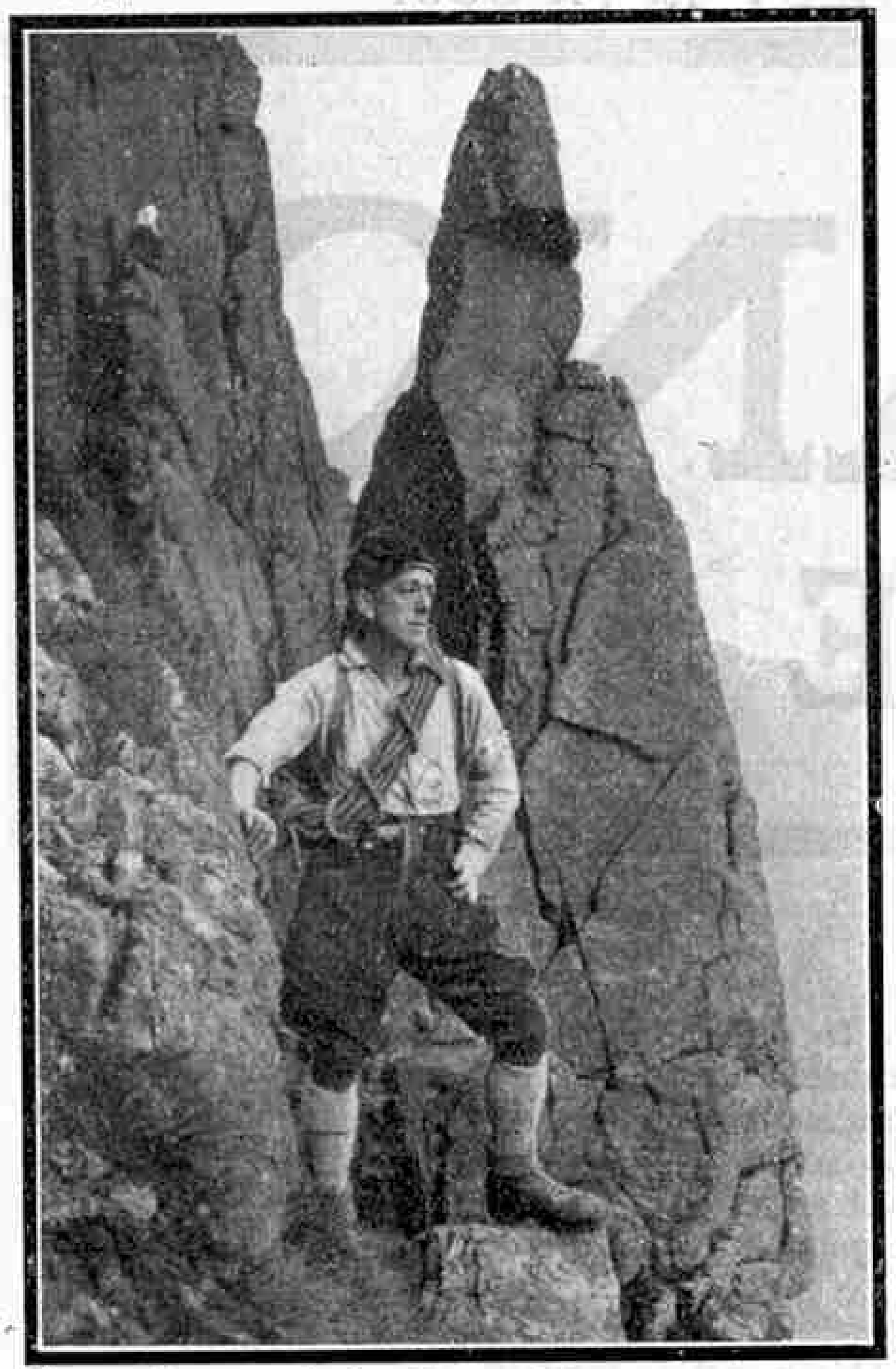
This day brings with it year by year memories of the opening of one of the greatest battles during the World War. At half-past seven on the morning of 1st July 1916, the terrific bombardment to which the German positions on the Somme had been subjected for seven days and nights suddenly ceased, and on a front 16 miles in width British troops went "over the top" to begin the first really great attack made on the German lines since the beginning of the war. At some points they gained ground; at others they were held up by machine gun nests that had survived the artillery bombardment and at these points the battalions engaged suffered fearful losses. This was only the prelude to a gigantic struggle that continued well into the Autumn, with enormous losses on both sides.

The most deplorable feature of the War was, of course, the waste of human life—more than seven million men killed and enormous numbers of others maimed for life. The recollection of this waste alone should be sufficient to make us all determine that it shall never be repeated. The war brought about another kind of waste, however, and one which, I believe, is not sufficiently realised; namely, waste of brain power. Throughout the war years, scientists and engineers all over the world concentrated their energies upon one of two problems—the production of more deadly means of slaughtering human beings and reducing towns to ruin, or the production of more efficient means of resisting attack. This was inevitable at the time, but it is important for us to remember that most of this work concerned, not construction, but destruction It is true that in some directions the war led to rapid advances that have had permanent results; this is notably the case in regard to aircraft. But, generally speaking, we are little better off as the result of the efforts of our wartime experts. If the intense concentration of brain power of the war period could have been devoted to the requirements of peace, the world would be a better place to-day.

It is a striking fact that although many men have become famous through the invention of some new weapon of destruction, not one of them has achieved the undying fame of the men who have devised new machines, processes or methods to help on the progress of the world. Take for instance Josiah Wedgwood, the bi-centenary of whose birth occurs during this month. Here was a man who never achieved anything to thrill the public imagination. But he revolutionised the pottery industry, and he will be remembered as long as civilisation endures.

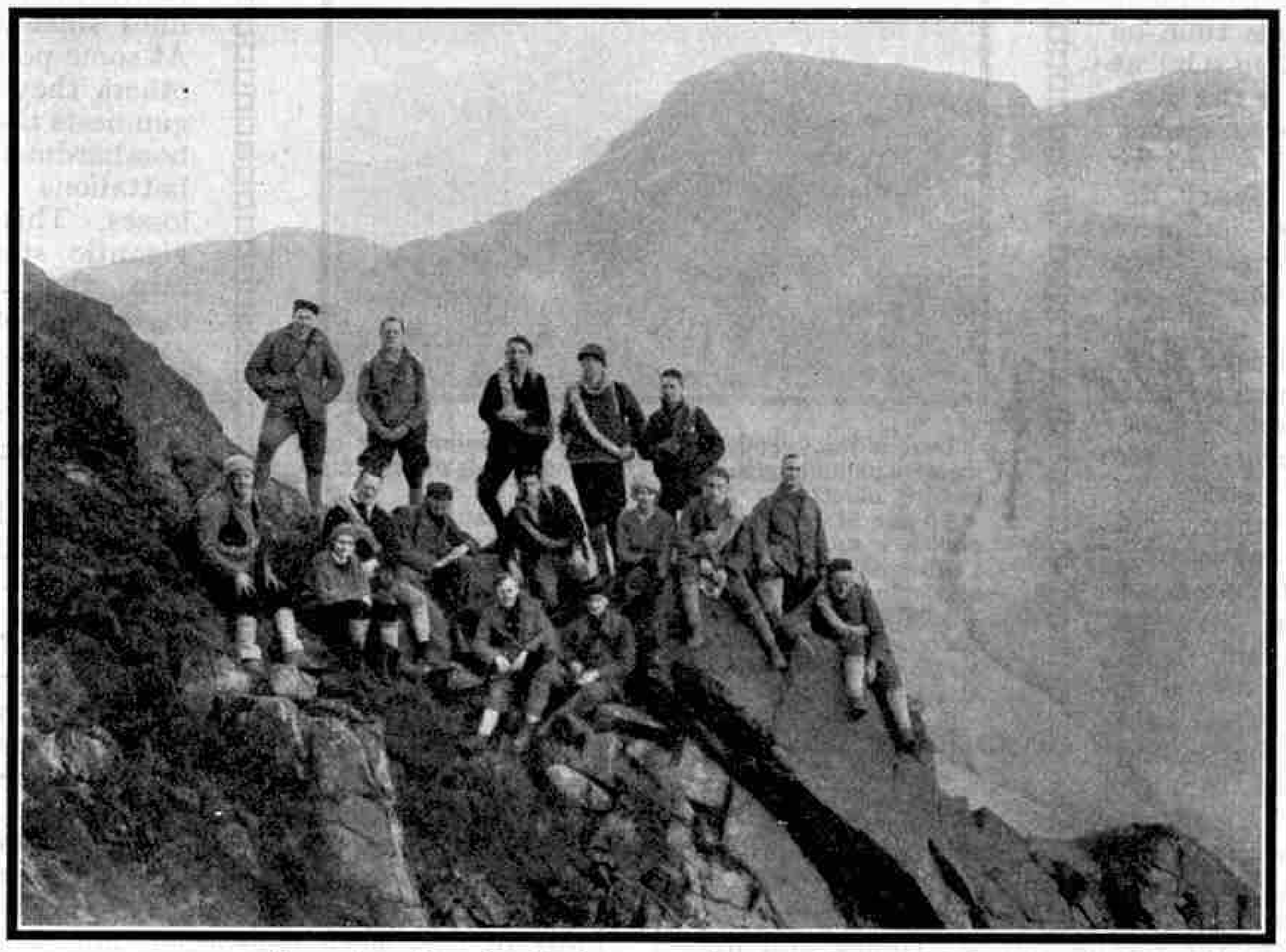
Thrills with the Rock Climbers

By J. E. B. Wright (Chief of the Lakeland Mountain Guides)



The author and the Napes Needle, of which he has made over 250 ascents.

FOR countless centuries the great mountains of the world were objects of fear and veneration, to be avoided if at all possible. The idea of climbing a mountain for pleasure does not appear to have occurred until the Middle Ages, and the records of such climbs do not go back earlier than about the 13th century. Mountaineering in fact may be regarded as one of the youngest of our sports, and the special branch known as rock-climbing, although its story goes back as far as 1826, is very largely a post-war development.



A party of rock climbers resting on Great Gable.
The illustrations to this article are all from photographs by R. Mayson, Keswick.

There is a vast difference between the technique of rock-climbing in the English Lake District and that required for the snow and ice climbing in the Alps, and in many respects the former is the more difficult of the two. Rock-climbing consists essentially in ascending some particular peak or rock pinnacle, and makes severe demands upon nerves, mental alertness, and climbing skill; mountaineering on the other hand aims at the attainment of the summit of a mountain rather than of an individual pinnacle, and calls more particularly for great physical endurance to enable the climber to toil steadily upward for a whole day or more. In rock-climbing the footholds and handholds are often very precarious, consisting of ledges of rock perhaps less than an inch in width. The 200 ft. of exposed crag on Great Gable, or Pillar Rock, proves more difficult in ascent than the whole 14,000 ft. of the Matterhorn.

In the English Lake District the art of rock-climbing has been developed to a degree that cannot be equalled in any other mountain area. Cumberland has been termed the "Nursery of the Alps," and many men who first learned to use climbing nails on the crags of Scafell and Great End have left imperishable records of achievement upon the greatest mountains of the world.

The popular rock-climbing grounds of the Lake District are six in number, and they are situated upon five of the highest mountains. Scafell Crag, whose pinnacle rises to a height of 3,000 ft., is on the west side of Scafell summit, which is the second highest peak in England. Scafell, 3,162 ft., and Scafell Pike, 3,210 ft., are divided by the Mickledore Ridge, and the two summits are approximately a mile apart. Pillar Rock is on the north side of Pillar Mountain, overlooking the wild uninhabited valley of Ennerdale. Doe Crag is situated near to Coniston. The Langdale Pikes possess two precipitous faces—Pavey Ark, which abuts on the north-east side, and Gimmer Crag, which overlooks the Mickleden Valley on the south-east side.

The most popular of the Lakeland mountain playgrounds, however, is Great Gable. The Napes Ridge, on the south side of Gable Mountain, commands the finest of our lake views. Each of its buttresses possesses a unique attraction. There is the Sphinx Rock on the extreme west, which is entirely detached from the main ridge of the same name; the Arrowhead, shooting into the sky like the probe of some giant archer, is a part of the main Arrowhead Ridge; Eagles' Nest, an almost inaccessible eyrie, is approached by devious ways, the Direct Arête, an abutment 200 ft. in height, being the most difficult buttress climb on the mountain. Not many yards away stands Cumberland's proudest possession, unique among mountain ranges, a tall graceful spire of rock—the incomparable Napes Needle. Some idea of the difficulty of ascending the Needle may be gained from the fact that a rock-climbing party composed of two men and a woman took two-and-a-half hours to complete the climb on Good Friday of the present year.

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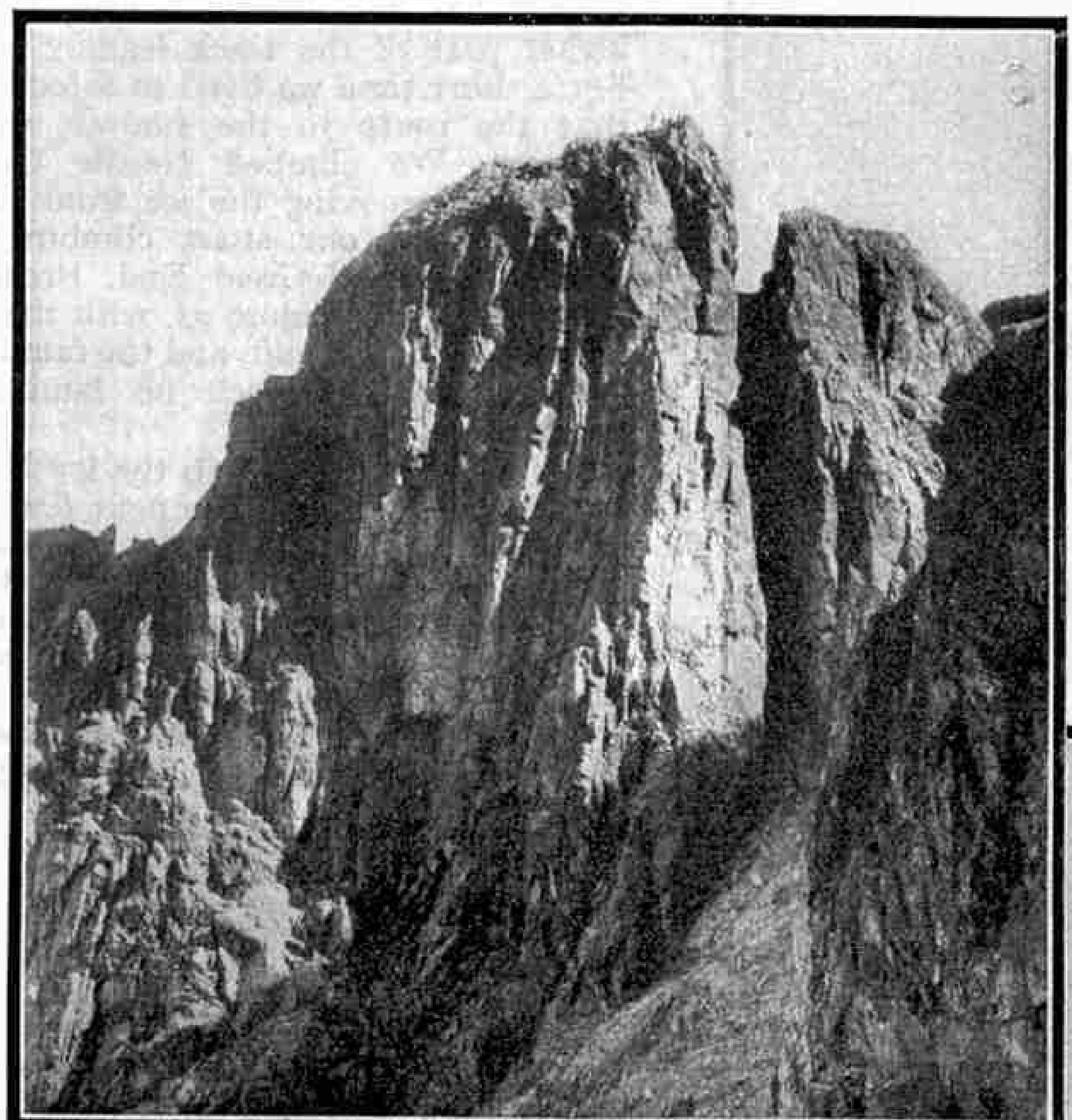
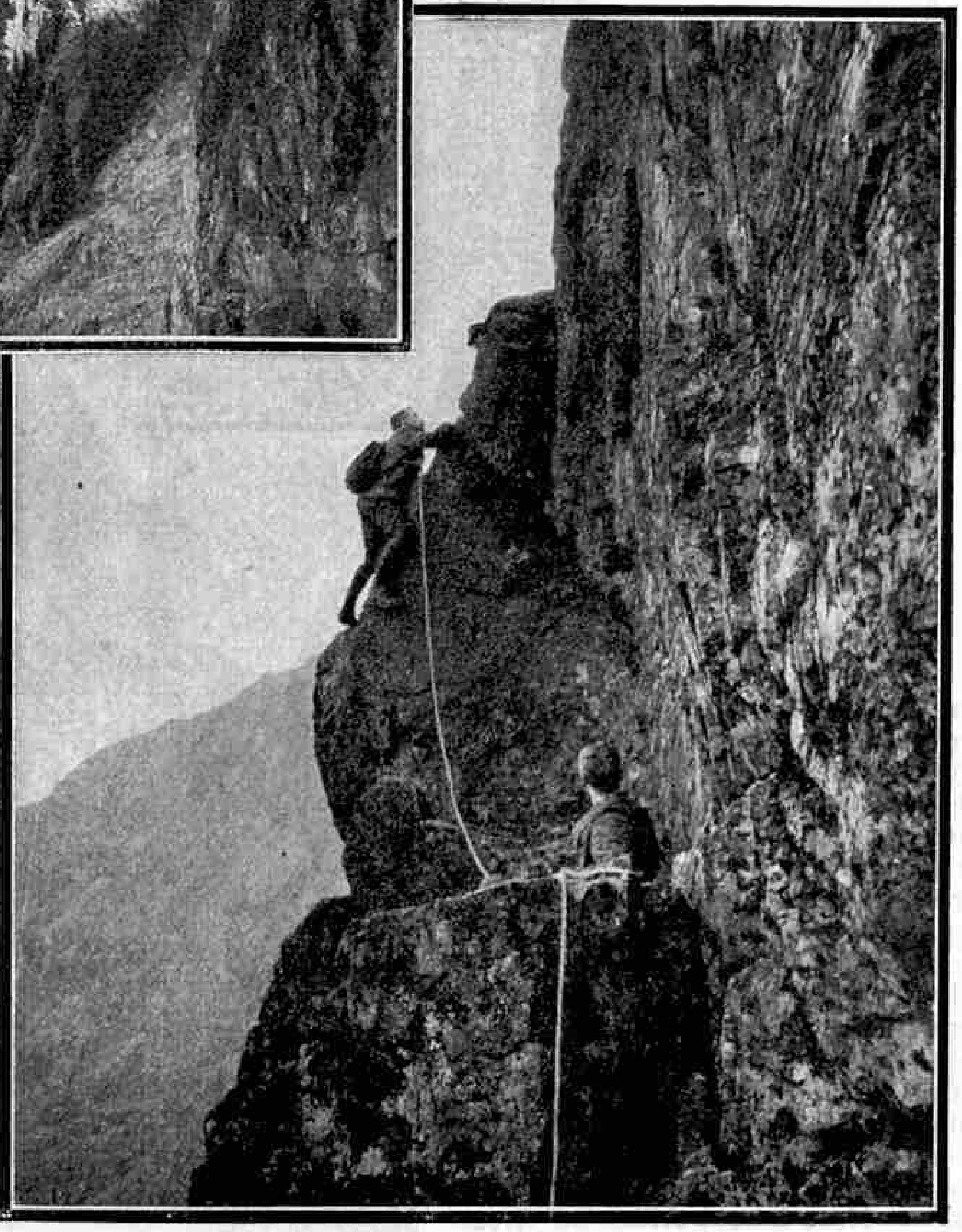
The summits of the Needle, Scafell Pinnacle and the Pillar Rock can be reached only by the expert rock-climber. Each crag possesses various routes of ascent and descent; there are five different ways of climbing the Needle, thirty-two different ways of reaching Scafell Pinnacle, and forty separate routes on Pillar Rock. These routes are called "courses," and they vary in height from 100 ft. to nearly 1,000 ft. The courses vary considerably in difficulty, and they are divided into six classes — easy, moderate, difficult, very difficult, severe, and very severe. Parties of three are the best combination for the purpose of attack. Alpine nailed boots are a necessary part of each climber's equipment, except for climbs of high severity, when boots are discarded in favour of rubber plimsols. Lengths of Alpine rope, measuring from 60 ft. to 200 ft., are used to tie the three members of the party together; but contrary to Alpine climbing methods, only one man moves at a time, and all the responsibility for the safety and success of an expedition rests upon the first man, who is called the "leader."



(Above) The west face of Pillar Rock. (Below) Climbing over the Nose, Pillar Rock. This photograph illustrates the careful roping methods.

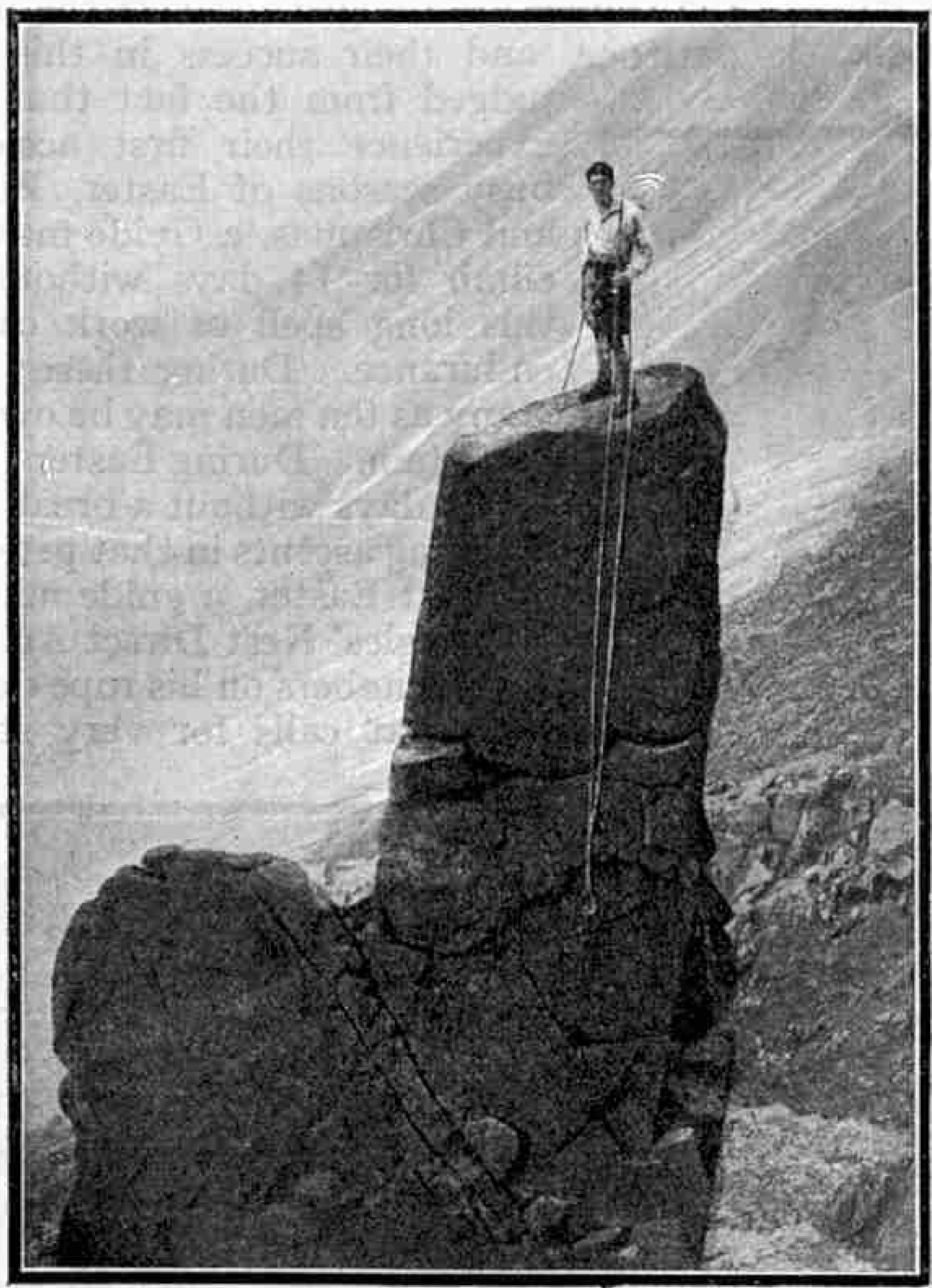


Mountaineering differs from many other sports in producing a strong spirit of rivalry between the amateur and the professional. In Cumberland this rivalry is very pronounced, and it finds expression in competitive achievement. For many years the record for the largest number of ascents of the Napes Needle was held by an amateur; a guide now leads with a total of 256 ascents. The height of the Needle is 110 ft. from the lowest point of its irregular base. Up to this year the fastest time for the climb—up and down—was 85 seconds, this record being established by myself during August 1929. Early this year the report reached me that an amateur had reduced this time to 65 seconds. Immediately it became a matter of professional honour to regain the record, and last Easter I made a serious attempt to reduce this amazing time of one minute five seconds. Four times I climbed up and down the Needle, but although I lowered my own record each time to 80, 77$\frac{2}{5}$, 72, and 67$\frac{2}{5}$ seconds, I failed to beat the amateur's time. Finally, after a short rest, I decided upon one more effort, and this time I succeeded in accomplishing the climb in 64 seconds. I take no particular pride in this achievement, because speed climbing is highly dangerous and therefore a bad type of climbing.

During the last five years more than 400 rock-climbers have been on the ropes of the Lakeland Guides and only 20 of this number have possessed previous experience of crag climbing. With so large a proportion of beginners the Guides are obliged to exert the utmost caution and patience, and their success in this direction may be judged from the fact that they have yet to experience their first accident. During the busy seasons of Easter, Whitsuntide, August and Christmas, a Guide may be called upon to climb for 14 days without a rest day, and this long spell of work calls for very great endurance. During these "rush" periods as many as ten men may be operating on the same mountain. During Easter 1929 a guide worked for 21 days without a break and made 47 rock-climbing ascents in that period. In the present year, at Easter, a guide made three ascents of the Eagles' Nest Direct Arête in one day with three climbers on his rope during each ascent, a feat that calls for very steady nerves.

Two Guides above all others excite the admiration of boys who come to the Lakes; these Guides are J. R. Files and A. J. Hope. They are both under 25 years of age, and they both stand 6 ft. 2 in. in their bare feet. To watch them at work on the crags, with arms and legs outspanned, is to experience the extreme of mountaineering delusion, for when the shorter-built climber comes to follow in their wake he finds the finger holds a good six inches beyond his reach! Files is a modest, steady type, who neither drinks nor smokes, and he drives a Sunbeam cycle at most amazing speeds. Hope is a "wag," and a sarcastic one, but when the cloak of biting wit in which he hides his real self has been pierced, this huge specimen of humanity is a very lovable character.

Two years ago Hope and I started out in the depths of winter to explore the north face of Great End. This 900 ft. precipice was masked in snow and ice, and after three hours of climbing of the "touch-and-go" type we emerged triumphant upon the summit ridge. Feeling very proud of our feat, which was accomplished without an ice axe, we began to descend a long snow slope set at an angle of about 40 degrees. The snow was in splendid condition, and we began to glissade. Suddenly, without the slightest warning, the snow gave place to solid ice, and we found ourselves on the glassy surface before we could check our speed. We began to slide at an amazing rate, both retaining sufficient self-control to use our hands as brakes upon the ice. Quickly our hands began to burn and blood to flow, but we could not check the awful speed. After 600 ft. of fast ice-riding we reached the cup of the col and came to rest. We were both as white as a sheet, and each knew that the other had felt the fear of death during that awful ride. Hope turned to me, badly shaken, but with a brave glint still in his eye, and said: "Well, that didn't take long, did it?"



(Top) The author on the summit of the Napes Needle.

(Right) Climbing Eagles' Nest Direct Arête, one of the most difficult ascents of Great Gable.

(Inset) Ronald J. Mustchin, aged 16, the youngest of the Lakeland Guides.

The "baby" of the Lakeland guides is Ronald J. Mustchin, and he is indeed the "infant prodigy" of Cumberland. He was only 14 years old when he first "led" the Needle climb; now, at 16, he has over 60 rock-climbing "leads" to his credit, and is as expert and capable as the oldest member of the staff. His greatest achievement was the "lead" of Slingsbys' Route to Scafell Pinnacle on Easter Monday of this year. The whole crag was covered with snow and ice, and his party consisted of seven men, all with previous experience of first-class peaks in Switzerland. Two members of the party were chosen as the leaders of each rope, with Mustchin as the second man on the first rope. The excursion soon developed into an Alpine expedition, and at the base of Slingsbys' Chimney, which is undercut and was badly iced at the time, the amateur leader was obliged to resign his responsibility to the young guide. Every member of the party expressed admiration at the manner in which Mustchin overcame all difficulties, and finally led the party to the summit of the Pinnacle after four hours' severe climbing. To find caution and strong nerves in a boy of immature years is remarkable, and to these qualities this boy adds the charm of genuine modesty. He has musical ability, too, and I could sit for hours while he woos sweet melodies from his violin.

Moyle is our star rock-climber. The severe climbs on Gimmer Crag, the Eagles' Nest Direct Arête on Great Gable, and the North Climb on Pillar Rock, are the most difficult ascents up which we guide inexperienced climbers. Moyle takes them all with an easy mind and a perfect grace of movement that inspires confidence in those who are to follow him. He is a born "leader."

Tom Barlow is the last of our "regulars." Our mutual joy lies in guiding parties of schoolboys and girls to the summits of British mountains. One of our greatest feats was accomplished in joint harness on Easter Wednesday 1929, when we brought 90 London boys and girls safely to the Summit of Snowdon over the snowbound Bwlch-y-Main Ridge. There were sixteen adults in that party and they caused us infinitely more anxiety than the whole ninety youngsters!

No mountain venture in which I have taken part has equalled the climb of Great Gable on New Year's Day 1929. Cumberland provides genuine Alpine conditions during the winter months, and on this occasion six knights of the rucksack made an attempt to reach the summit of Gable Mountain. Heavy clouds hovered high over Sty Head Pass, and Great End looked grim and forbidding. As we set our feet in the eastern end of the Traverse we beheld a scene of entrancing beauty. Kern Knotts Crags, the great Napes Ridge, and the Westmorland Crags formed three separate tiers, each surmounting the other in the order in which I have given them; and all these bastions of rock were shrouded in a thin veneer of blue ice. The surrounding clouds enhanced the brightness of one great rift through which the sun blazed its rays upon these icy crags. With caution we made our way over the boulders of Kern Knotts and were surprised to find only intermittent drifts of snow on the higher part of the track leading to the Napes Needle. For a short time we lived in a fool's paradise, imagining that the route to the summit would prove an easy passage. We climbed Needle Gulley without much difficulty, removing the ice from the rock steps with a sharp jab of our stout climbing boots. The snow-covered peaks of Great End, Broad Crag, Scafell Pike and Scafell were before us, with the Napes Needle in the immediate foreground, and the familiar valley of Wasdale—the charm of which no familiarity can destroy—lay 2,000 ft. below.

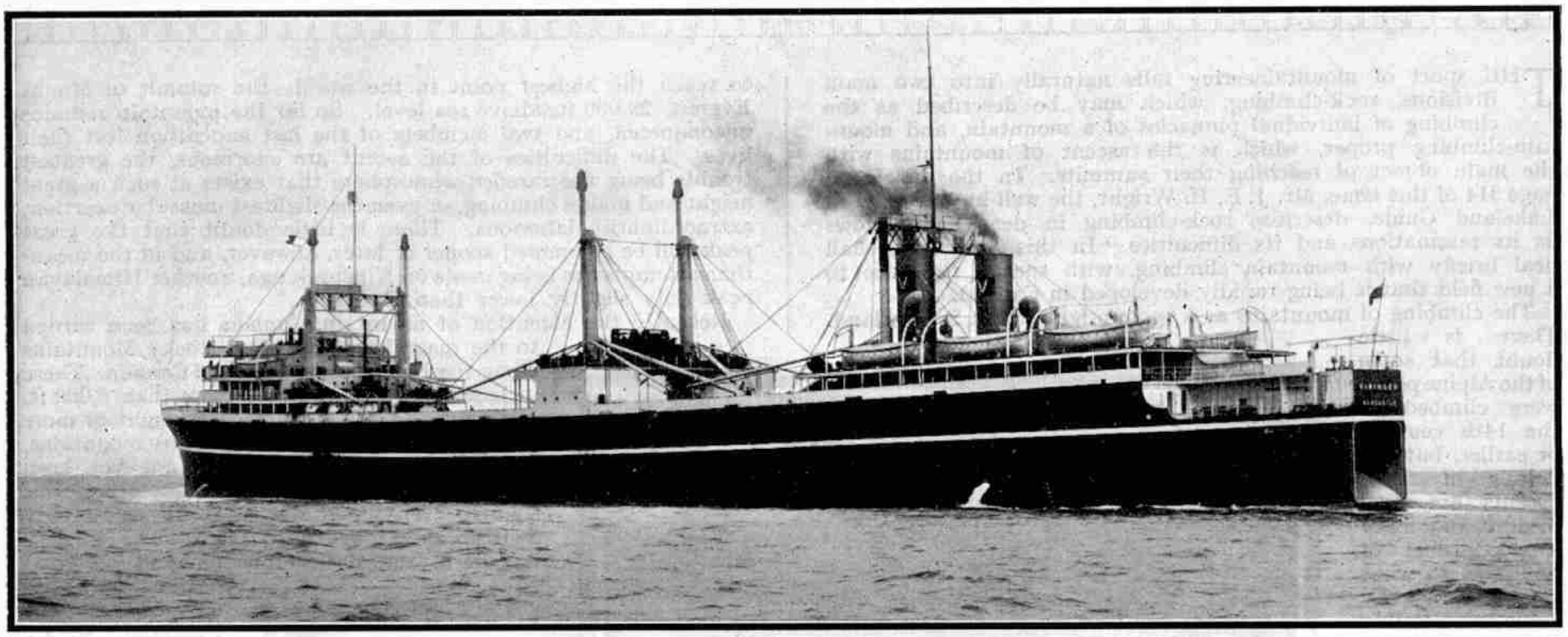
We tried hard to climb the icy Needle, but our efforts were of no avail. In the next few yards of progress we were obliged to pass under the Eagles' Nest buttress, and one single glance at the Direct Arête in those conditions was sufficient to send a shiver of apprehension down my spine. We reached the base of the Sphinx Rock, only to be rudely awakened from our dream of security by the sight of the great banks of frozen snow that covered the screes of Little Hell Gate. This great moraine sweeps down into Wasdale at an angle of nearly 40 degrees, and I think Barlow and I realised simultaneously that no easy task confronted us in forcing a passage for six climbers up 400 ft. of frozen snow.

In our wisdom we roped up the six climbers, three to Barlow and three to myself, without unduly giving expression to our thoughts and our doubts. We began to cut steps and kept on making steps for an hour-and-a-half. I shall always remember the feeling of intense relief to my aching limbs when the saddle of the Great Napes loomed into sight. On the breast of the col we paused to admire the fine southward panorama, which proved a very inadequate prelude to the view that awaited us at a higher altitude. We prayed that the final 300 ft. of the ascent would prove less toilsome. It did, but it provided a particularly vicious brand of ice, upon which I almost broke my toes and my temper without making the slightest impression. After slithering about in a most alarming fashion, an exit was made from the final gully and we emerged cold and tired, but victorious. At twenty minutes to four we reached the summit cairn, and a combination of circumstances proved that we were indeed a fortunate climbing party.

The view range was tremendous. Snow-clad peaks reared their proud heads to every point of the compass; the clearness of the atmosphere was remarkable, and the sun was beginning to sink towards the horizon. To the west and north-west we counted sixty-five peaks in Scotland. Every peak and high plateau in the Pennines from Cross Fell to Ingleborough

(Continued on page 566)

A Floating Whale Oil Factory



ONE of the most interesting vessels launched last year was the "*Vikingen*," a twin-screw steamship built and engined by Swan, Hunter, & Wigham Richardson Ltd., Wallsend-on-Tyne, for the Viking Whaling Co. Ltd., of London. This vessel has been specially designed as a factory for extracting oil from the carcases of whales, and for carrying oil in bulk.

The leading dimensions of the "*Vikingen*" are length 490 ft., width 71 ft., moulded depth 34 ft., and deadweight carrying capacity over 14,000 tons. She has been built on the longitudinal system of framing with a closed superstructure deck, and she carries Lloyd's highest class, and also conforms to the regulations of the Board of Trade. The twin-screw main engines and the boilers are in the after end of the ship. The engines, which are of the triple-expansion type, develop 430 I.H.P., steam being supplied by four single-ended boilers with a working pressure of 210 lb. In addition, there are two auxiliary boilers installed at the fore-end of the machinery space to supply steam to the deck machinery and to the plant in the whaling factory.

Accommodation for the engineers and stokers is provided at the after end. The captain, officers and sailors, and also the factory workmen, have their quarters at the forward end underneath the navigating bridge on three decks. The ship also carries a doctor.

In addition to being a floating oil factory the "*Vikingen*" will act as a mother ship to a flotilla of small fast steamships known as whale catchers. Each of these vessels is equipped with a harpoon gun on the forecastle, and has specially quick-turning steering gear that enables it to manœuvre rapidly when chasing whales. The head of the harpoon contains an explosive charge that kills the whale almost at once, and as soon as this has been done the carcase is inflated with compressed air so that it cannot sink, and a flag is stuck into it to mark its position. When two or three whales have been obtained in this manner they are towed to the factory. The catchers then obtain fresh supplies of oil fuel and fresh water from the mother ship, and set off again to chase more whales. The "*Vikingen*" also provides accommodation for the crews of these whale catchers.

The whales vary in size from about 40 ft. to 100 ft. in length, and may weigh anything up to 100 tons. By means of two powerful winches amidships a whale's carcase is hauled bodily up the slipway built in the stern of the ship on to the blubber deck, which is practically flat and is sheathed with wood. The flukes of the tail are cut off, and then the blubber, which is the fatty outer portion of the carcase, is removed by means of long slices and knives. On a well-fed specimen the blubber may be as much as 18 in. in thickness. This valuable fatty matter is passed through holes in the deck to the factory, which occupies the 'tween decks for nearly the whole length of the ship.

The carcase of the whale is next hauled by means of the forward winches to the meat deck, where the flesh is cut off and the bones are sawn into pieces by steam-driven saws. The pieces of the carcase thus obtained are passed through a number of small hatches on the sides of the deck into steam boilers in the forward part of the factory, in order to extract the oil and other residues.

In the 'tween deck factory are installed large numbers of great steam boilers, tanks, pumps, and sundry patent apparatus for boiling down the blubber, flesh and bones, and for extracting from them various grades of oil. The blubber yields the finest quality of oil, that obtained from the remainder of the carcase varying considerably in quality. The blubber residue is known as "grax," and it is collected in troughs and pumped to a grax press in order to extract further oil. Very little of the whole whale is wasted; even a lot of the offal is used to feed pigs that are kept on board, and which provide a change of diet that is exceedingly welcome to the crew.

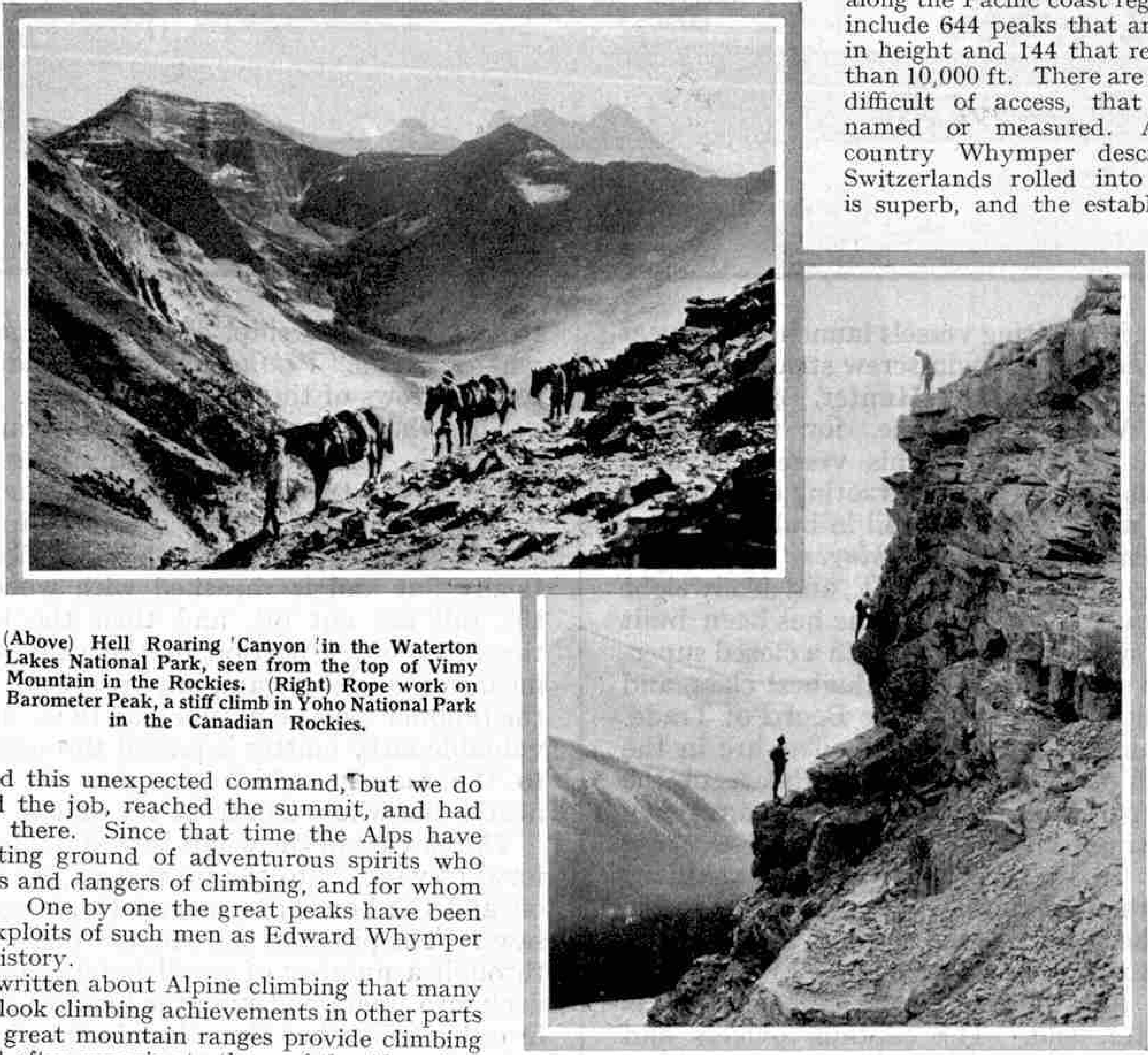
The ship carries a number of heavy derricks used for lifting and turning the immense carcases. There are also about a dozen lighter derricks for handling the whales when they are in the water alongside the ship.

Climbing in the Canadian Rockies

"Sixty Switzerlands Rolled Into One"

THE sport of mountaineering falls naturally into two main divisions, rock-climbing, which may be described as the climbing of individual pinnacles of a mountain, and mountain-climbing proper, which is the ascent of mountains with the main object of reaching their summits. In the article on page 514 of this issue, Mr. J. E. B. Wright, the well-known English Lakeland Guide, describes rock-climbing in detail and shows us its fascinations and its difficulties. In this article we shall deal briefly with mountain climbing, with special reference to a new field that is being rapidly developed in Canada.

The climbing of mountains as a sport originated in Switzerland. There is little doubt that some of the Alpine peaks were climbed in the 14th century or earlier, but the details of these ascents are very meagre and leave a good deal of doubt as to what was actually achieved. Possibly the first really authentic ascent was that of Mount Aiguille, near Grenoble, in 1492. This 7,000-ft. mountain attracted the attention of Charles VII of France as he passed through Dauphiny, and, monarch-like, he promptly ordered his Chamberlain, de Beaupré, to climb it! There is no record of the feelings of this man when he received this unexpected command, but we do know that he tackled the job, reached the summit, and had three crosses erected there. Since that time the Alps have been the happy hunting ground of adventurous spirits who revel in the difficulties and dangers of climbing, and for whom height has no terrors. One by one the great peaks have been conquered, and the exploits of such men as Edward Whymper have passed into history.



(Above) Hell Roaring Canyon in the Waterton Lakes National Park, seen from the top of Vimy Mountain in the Rockies. (Right) Rope work on Barometer Peak, a stiff climb in Yoho National Park in the Canadian Rockies.

So much has been written about Alpine climbing that many people are apt to overlook climbing achievements in other parts of the world. Many great mountain ranges provide climbing possibilities equal and often superior to those of the Alps, but the efforts of mountaineers have been severely handicapped by transport difficulties. It is a simple matter for climbers to arrive at a suitable point for commencing the ascent of an Alpine peak, but in order to reach a convenient base from which to tackle the great peaks of other lands, elaborate and costly expeditions are often necessary.

For the earliest recorded climb of importance in mountains other than the Alps we must turn to Mexico in 1521, when the Spanish invader Cortez ordered some of his men to climb the volcano Popocatapetl, which is 17,850 ft. in height. Cortez tells us that these men succeeded in reaching the summit and in bringing back a considerable quantity of much-needed sulphur for the making of gunpowder. The Andes of South America were tackled by Edward Whymper after his Alpine triumphs, and he climbed Chimborazo, 20,498 ft., and explored other peaks. The mountains of North America and the Mountains of the Moon in Kenya, East Africa, have also attracted expert climbers, but in recent years popular attention has been focussed very largely on the attempts to reach the highest point in the world—the summit of Mount Everest, 29,000 ft. above sea level. So far the mountain remains unconquered, and two members of the last expedition lost their lives. The difficulties of the ascent are enormous, the greatest trouble being the rarefied atmosphere that exists at such a great height and makes climbing, or even the slightest muscular exertion, extraordinarily laborious. There is little doubt that the great peak will be conquered sooner or later, however, and in the meantime attempts are being made on Kinchinjunga, another Himalayan peak only slightly lower than Everest.

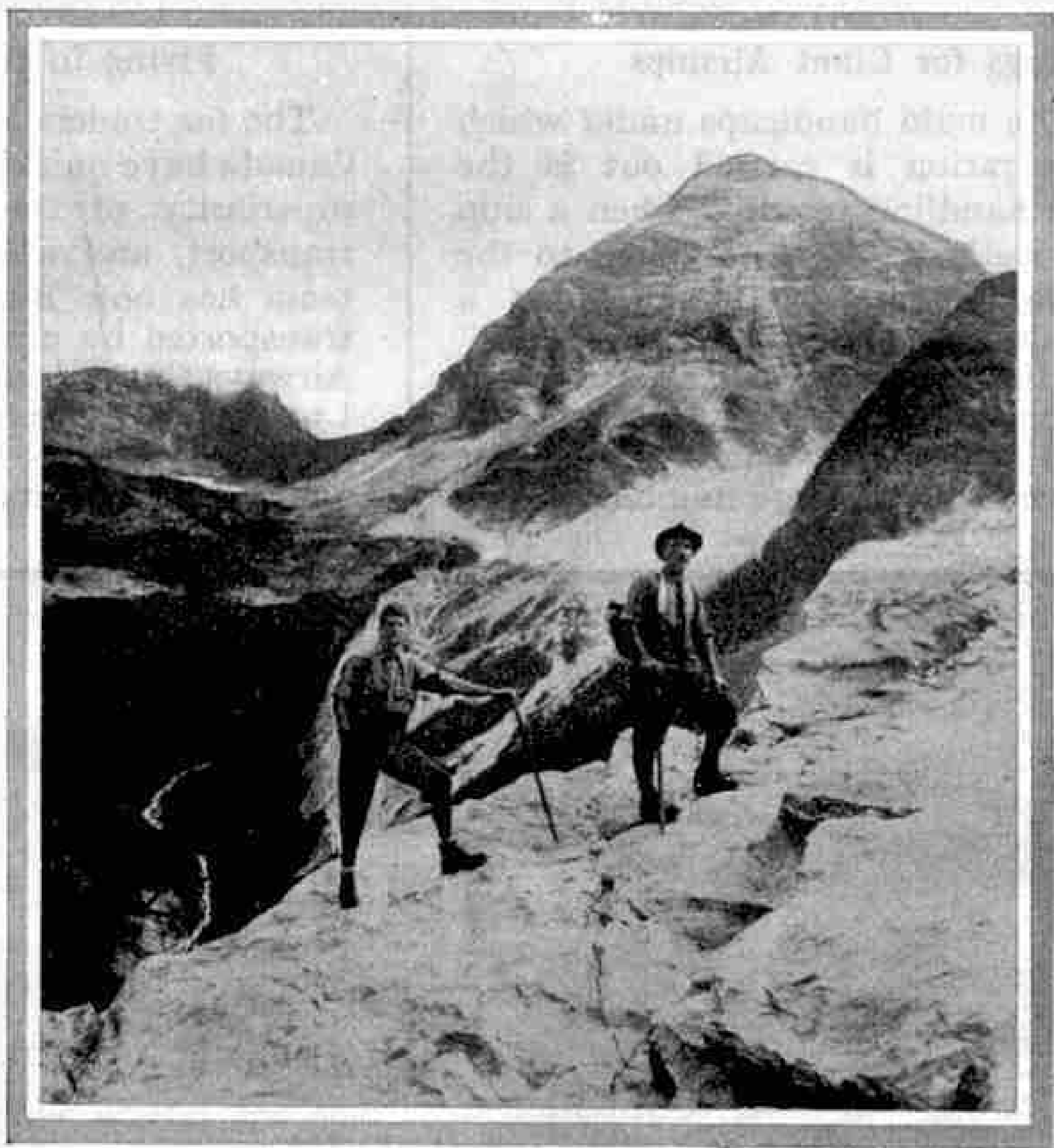
Recently the attention of mountain climbers has been turned to the magnificent range of Rocky Mountains along the Pacific coast region of Canada. These include 644 peaks that are more than 6,000 ft. in height and 144 that reach a height of more than 10,000 ft. There are also many mountains, difficult of access, that have not yet been named or measured. After exploring this country Whymper described it as "Sixty Switzerlands rolled into one." The scenery is superb, and the establishment of six great national parks has ensured that many thousand square miles of this wonderful region shall always remain in their present condition.

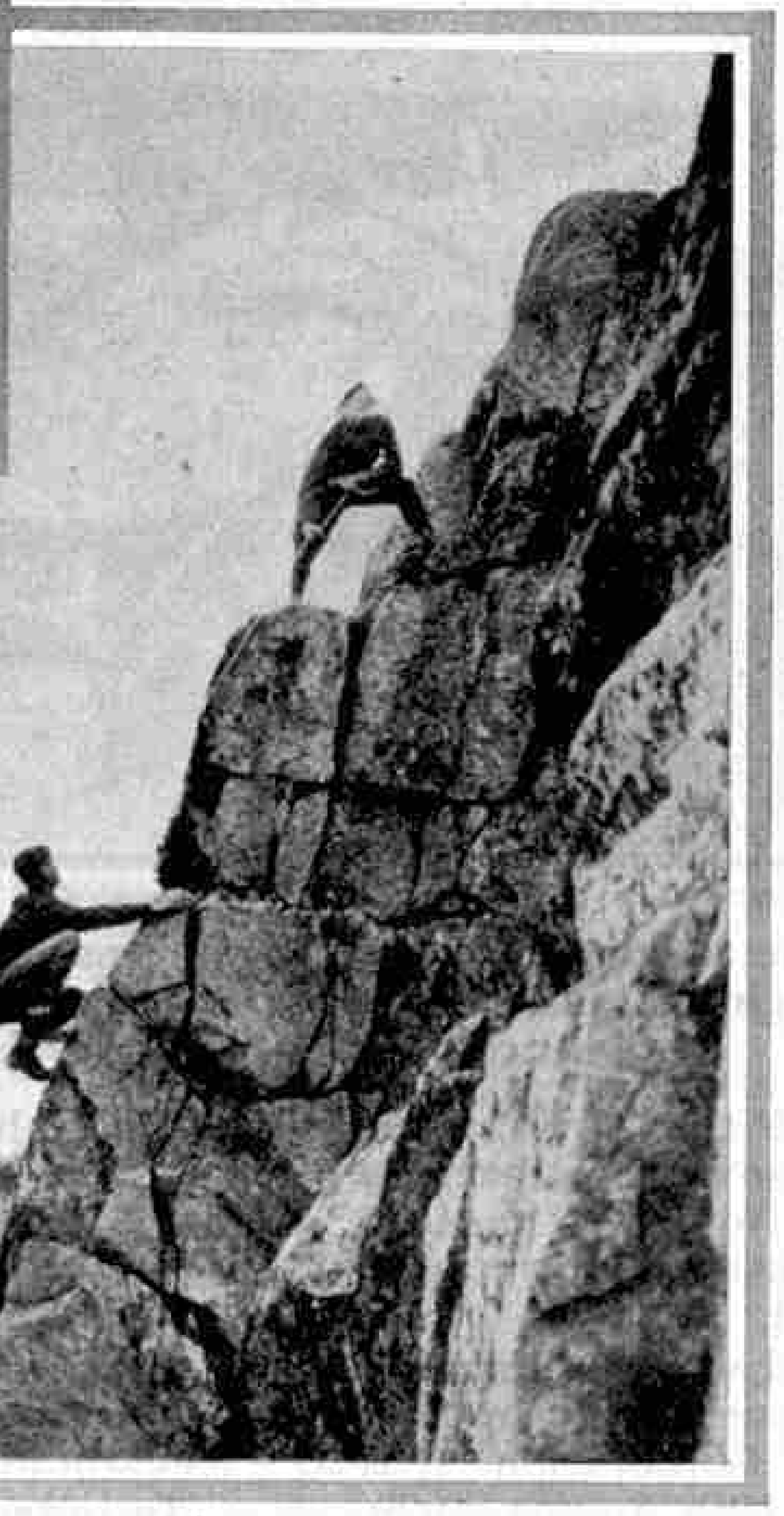
In preserving the natural beauties of the Rockies the mountain authorities have recognised fully the widespread desire of Man to climb to high altitudes. The mountains present an infinite variety of climbs, ranging from safe and easy ones for beginners to ascents of enormous difficulty that should be attempted only by thoroughly experienced climbers and with the assistance of guides. The attraction of the mountains is so great that the best known scenic centres have become the headquarters of large numbers of climbers, novices and experts alike. An energetic Alpine club has its headquarters at Banff, and a corps of experienced Swiss guides has been established in a model village, to which has been given the picturesque name of Edelweiss.

These developments have led to the conquest of most of the peaks of the Rockies and of the parallel Selkirk Range, and climbing expeditions have penetrated as far north as the Alaskan border, where Mount Logan, the highest mountain in Canada, towers upward to 19,539 ft. This peak was conquered in 1915 by a party of American and Canadian mountaineers led by Captain A. H. McCarthy. The ascent of Mount Logan was a really wonderful achievement, for climbing conditions in the Yukon are difficult at the best, and at times are extremely severe. The organisation of the necessary transport for a task of this description is in itself a triumph. Many of the most interesting and fascinating peaks of the Canadian Rockies are at great distances from centres of civilisation, and in many instances it is necessary for a mountain-climbing expedition to be equipped almost as if it were a party of explorers about to penetrate into an unknown country.

At present the efforts of climbers are centred chiefly on the peaks of the Rockies and the Selkirk Mountains of British Columbia. These are not as high as Mount Logan, nor as the peaks of the same range in Colorado. The highest mountain in the district, Mount Robson, reaches a height of only 13,068 ft. above sea level, but the mountains as a whole are more Alpine in character than the higher ranges. The glaciers and snowfields are immense, and although the former do not possess the marvellous complexity of the glaciers of Switzerland, they are of great beauty and interest. The mountains themselves are rugged and very striking in appearance. The majority of the great peaks of the world rise from high tablelands, but the average height of the bases of most of the peaks in Western Canada is only about 4,800 ft. In consequence the full effect of their height is obtained, and the visitor receives an overwhelming impression of grandeur.

On the weathered sides of the mountains areas of rotten rock are sometimes encountered, in which foothold is insecure and there is constant danger from falling stone. As compared with the Swiss Alps, however, the Canadian mountains, with the exception of the Yukon Range, do not offer any special technical difficulties, and there is certainly less risk of meeting with disaster from avalanches. Nevertheless the experienced climber finds splendid opportunities of practising the art of the mountaineer in its highest form, and in consequence the number of serious climbers attracted to this region increases year by year.





(Above) On the tongue of the Illecillewaet Glacier, in Glacier Park. In the background is the imposing head of Mt. Sir Donald, which rises to a height of 10,808 ft. (Right) Rough going on Mt. Abbott, a peak in Glacier National Park.

Although from a climbing point of view the Canadian mountains are only partially developed, many stirring instances of danger and heroism are already recorded. A thrilling story is told of the conquest of Mount Eon, a peak 10,860 ft. in height in Mount Assiniboine National Park. The ascent of this mountain was first made in 1921 by Dr. W. E. Stone, President of Purdue University, and Mrs. Stone. The two climbers packed up supplies for several days, and after an ascent in which they ran great risks from falling stones they arrived at the foot of a chimney, 40 ft. in height, that appeared to lead to the summit. Dr. Stone succeeded in making his way up the chimney to the dangerously sloping opening at the top, and then called out that he could see nothing higher. A moment later his wife was startled by the fall of a large stone, which was followed immediately by that of her husband. She braced herself to withstand a shock, for the two had been roped together, but the expected jerk never came. Apparently Dr. Stone, on reaching the top of the chimney, had untied the rope and then slipped on a loose stone. He fell 60 ft. and then rolled over a succession of ledges through a vertical distance of about 800 ft.

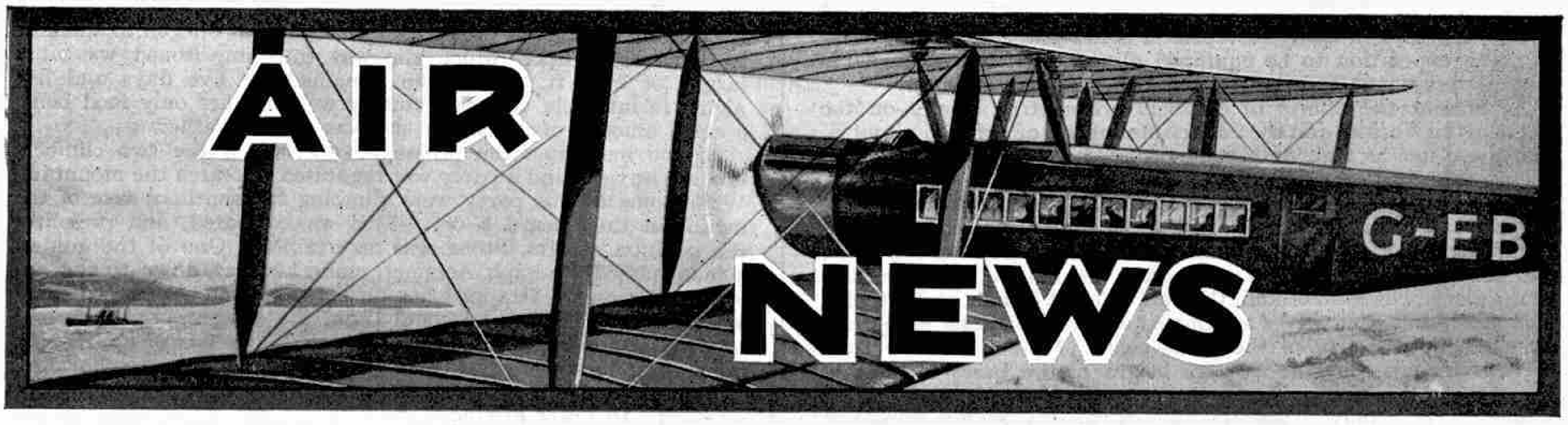
Mrs. Stone now found herself in a desperate situation. By the time she had recovered from the shock it was becoming too dark to descend, and she was compelled to spend the bitterly cold night in an exposed place, 10,800 ft. above sea level. Next morning she began the downward journey, but she missed the route by which she and her husband had ascended, and after two days of desperate effort she found herself on a ledge bordered by precipitous cliffs. To proceed further was impossible, and she could not retrace her steps, for she had tied her rope to a pinnacle to steady herself down a dangerous slope and afterwards had been unable to detach the rope, so that she was obliged to abandon it. The ledge upon which she was thus imprisoned was at a height of 7,500 ft. There she remained for five days and five nights in intensely cold and stormy weather, her only food being a small amount of moss that she was able to gather.

In the meantime the prolonged absence of the two climbers aroused anxiety and a party was organised to search the mountain. While some of this party were climbing the southern face of the mountain they heard a cry. This was repeated, and presently the position of Mrs. Stone was ascertained. One of the guides, a man named Rudolph Aemmer, made his way down to the unfortunate woman, strapped her on his back and set out to carry her to safety. Before he could begin the descent proper he had to traverse for a distance of about a mile a series of appallingly difficult and dangerous ledges. He accomplished this amazing feat without accident, and conveyed Mrs. Stone safely to lower ground.

A well-known climber, who is regarded as an authority on the Canadian Rockies, tells of a remarkable experience that occurred while he was climbing Mount Balfour, a peak 10,731 ft. in height near the Kicking Horse Pass, through which runs the track of the Canadian Pacific Railway. When he and his party were near the summit a fierce blizzard burst suddenly upon them. A flash of lightning struck the guide and bowled over the other members of the party like ninepins. Although the guide was stunned by the shock, he managed to call to his companions to throw away their ice axes and run for their lives; and they rushed at full speed down a dangerous slope and found shelter under some overhanging rocks. There they remained for an hour, almost frozen with the cold, with an abyss at their feet and around them the lightning playing incessantly. Apparently they were in the heart of the storm, and though they survived the experience they all felt afterwards as though they had been severely beaten and bruised.

Another wonderful mountain area in this region is Jasper National Park, and there is no finer place in the world for the Alpinist to show his mettle. It is said that there are in this park more than 100 mountain peaks, several of which are over 10,0 0 ft. in height; while Mount Columbia towers to 12,294 ft. and North Twin reaches 12,085 ft. In addition to the named peaks there are many unnamed ones that pass the 10,000 ft. level. In the 1928 season a number of noted climbers made a series of attacks on the Jasper Park peaks and for the first time Mount Scott, 10,826 ft., named after the gallant hero of the Antarctic, was conquered. The party that accomplished this feat began by establishing a camp in one of the largest ice basins in the Rockies at a height of 8,500 ft. Then they worked on the spectacular Scott glacier, and finally made the ascent of the mountain itself. In order to leave no doubt about the climb, they made it twice!

One of the most beautiful features of Jasper National Park is the massive Mount Edith Cavell, with its glacier and snowy summit. A motor road climbing a stiff gradient at certain points runs almost to the foot of the mountain, from where a glorious view of the glacier is obtained. The mountain reaches a height of 11,033 ft., and with its irregular formation and with snow crowning its massive summit it presents an imposing picture. Storms very frequently hover about the summit and it is unusual to obtain a clear view; but no matter what the conditions may be the trip is one that is long remembered by all who make it.

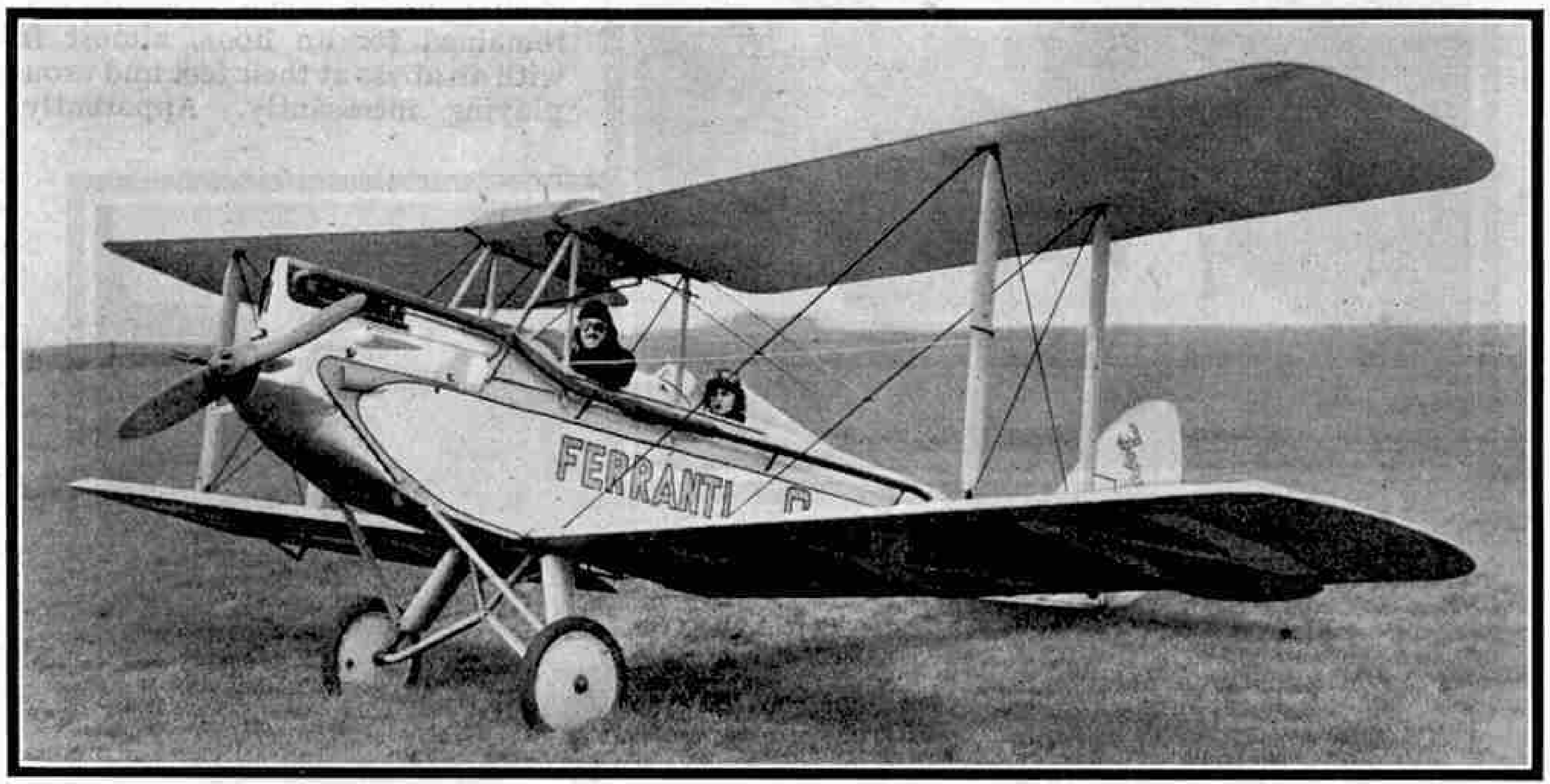


AIR NEWS

New British and American Airships

It is rumoured that a new airship is to be constructed by the British Government. This will be named the "*R 102*," and will have a capacity of 7,000,000 c. ft. It is also believed that a new all-metal airship is to be constructed in America for the United States Army. This vessel is expected to have a little more than one half of the displacement of the "*R 102*," the actual figure of its capacity being given as 3,758,300 c. ft. It is to be 547 ft. in total length, and will have a maximum diameter of 119 ft. 6 in. The total weight will be 67½ tons and the vessel will cost about £900,000 to build and equip.

The new American airship will be equipped with eight 600 h.p. engines, and these will give her a cruising speed of 100 m.p.h. She will also be fitted to carry two aeroplanes, together with the gear necessary for releasing them. A powerful 1,000 watt searchlight also will be mounted. The armament of the airship will consist of one 37 m.m. gun and ten machine guns, while from two to seven tons of bombs and about 30,000 rounds of ammunition will be carried.



Courtesy] [Ferranti Ltd.

The advantages of aeroplane transport are recognised by Ferranti Ltd., the well-known electrical engineers, and our photograph shows Mr. V. Z. de Ferranti, Chairman of the Company, about to commence a business flight. The machine is used principally in wireless research work.

Presumably the vessel will be of similar construction to the one built by the Aircraft Development Corporation that made her first flight on 19th August, 1929. This ship, named the "*ZMC2*," is of all-metal construction, and has a displacement of 200,000 c. ft. She is 149 ft. in total length, 53 ft. in maximum diameter, and has a cruising range of 680 miles at 50 m.p.h. The covering of the airship is of aluminium alloy sheeting that is less than one hundredth of an inch in thickness. Seven people may be carried in the vessel, which is capable of supporting a useful load of 3,127 lb., and she is equipped with two 220 h.p. Wright "Whirlwind" engines.

The King's Cup Air Race

The annual race round England for the King's Cup is to take place this year on 5th July. It is interesting to note that the Prince of Wales and Prince George have both entered machines.

Tugs for Giant Airships

One of the main handicaps under which airship operation is carried out is the delicacy of handling required when a ship is being "walked" from the shed to the mooring mast or back again. For a vessel of the size of "*R100*" or "*R101*" this operation requires the assistance of about 500 men, who haul ropes attached to the airship in order to guide and pull it along. Even when a large number of men is available the operation always is attended with danger, for if a cross wind should happen to blow upon the ship when partly housed, she may be dashed against the side of the shed and badly damaged. This was shown by the accident that occurred some time ago, when one of the elevator fins of "*R100*" was badly damaged.

In order to prevent further accidents of this kind, two huge mechanical "hands" are being constructed for use at Cardington. The "hands" are carried on trolleys that run on rails between the shed and the mooring mast. They consist of claw-shaped metal members that grip the airship and hold it firmly while on its way to the mast. There it is secured in position before being released from the claws.

The new apparatus is claimed to be the first of this type to have been constructed in any country. For airships, it will perform the same service as tugs carry out for large ocean-going vessels. Further developments on similar lines no doubt will take place and eventually giant airships will be taken in and out of their sheds as easily as transatlantic liners are manœuvred in and out of dock.

Flying in the Frozen North

The fur traders and trappers of northern Canada have quickly been convinced of the superiority of the aeroplane for winter transport, and wherever possible the dog team has now been abandoned and furs transported by air. The Western Canada Airways Co. Ltd. and Commercial Airways Ltd., the two companies operating in those regions, report having carried great quantities of furs from the Mackenzie River trading posts, both for the Hudson's Bay Company and North Traders Ltd. In addition the cargoes handled to and from the north have included foodstuffs, medical supplies, ore samples, mining and prospecting equipment, live fur-bearing animals, wireless sets and components, and other miscellaneous merchandise.

The services operated by the Companies have completely changed the methods of transportation in the immense stretch of country between Edmonton and the mouth of the Mackenzie River. The mails along the 1,500 miles of the course of this river are now carried by air instead of by steamer. During the greater part of the year ice prevents navigation of the river, but in the five winter months, of 1929-30 no less than110,000 lbs. of mail and express matter were transported by air in the Mackenzie district. Further, 780 passengers were carried, these including clergymen, prospectors, trappers, Government officials, and patients for medical attention.

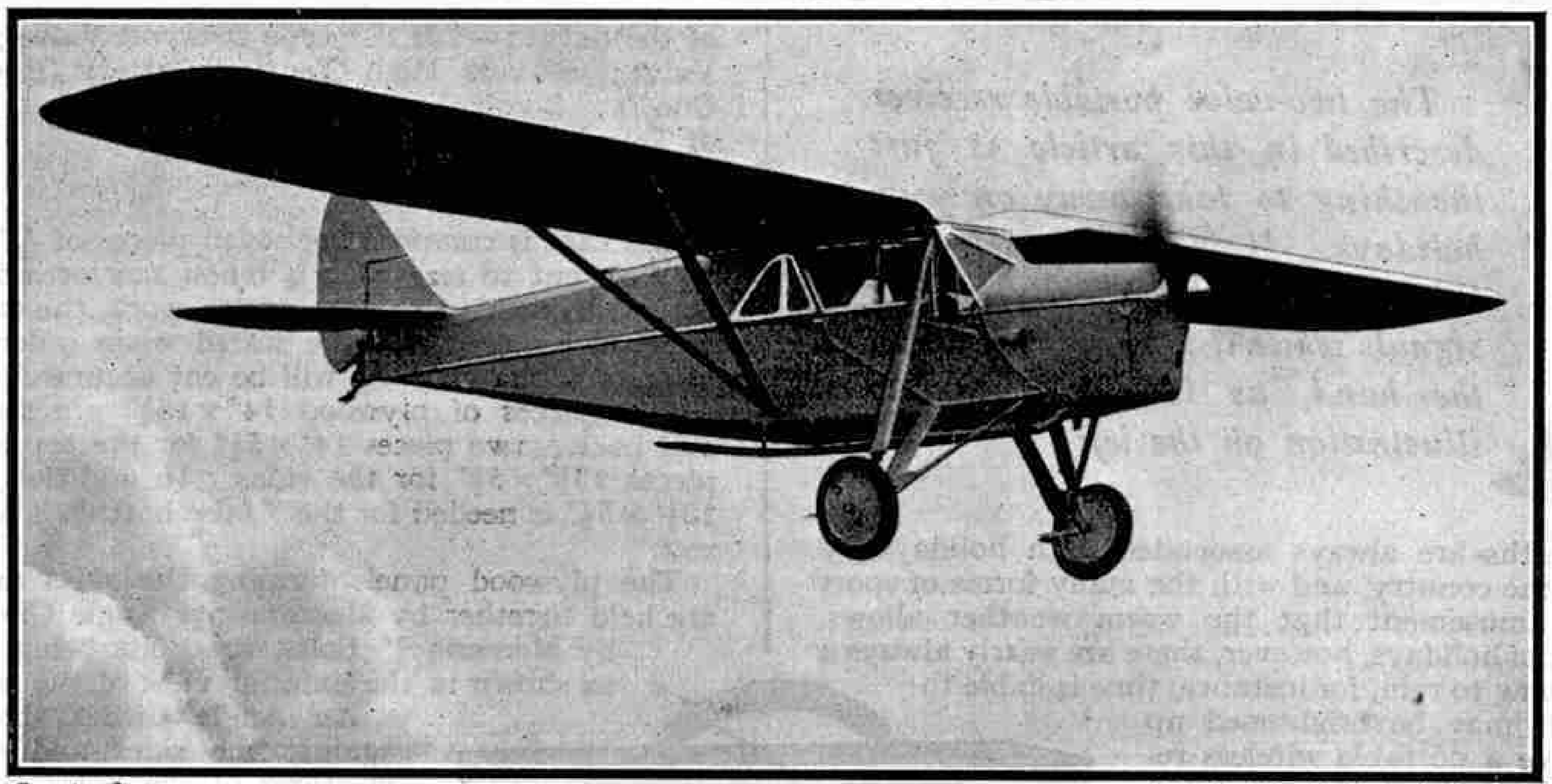
London-Karachi Air Mail Service

The England-India air mail and passenger service is now operating through Central Europe and on an accelerated time-table. The route is by way of Cologne, Nuremburg, Vienna, Budapest and Belgrade to Salonika. From the last named city the mails are forwarded by flying boat to Athens, where the route joins the original one to Alexandria.

All aircraft operating on the mailplane route are now of the triple-engined type, and with them India is reached in seven days and Egypt in three.

The D.H. "Puss Moth"

The de Havilland "Puss Moth," or "Moth III," is the latest product of the well-known de Havilland Aircraft Co. Ltd., of Stag Lane Aerodrome. This machine is not intended to supersede the "Gipsy Moth," but is an addition to the de Havilland range. It is a cabin semi-cantilever high wing light monoplane, and is fitted with a new type of de Havilland engine, the inverted 120 h.p. "Gipsy III."


Courtesy] [De Havilland Aircraft Co. Ltd.

The de Havilland "Puss Moth," a high-wing monoplane that is specially designed for long range at high speed. The 120 h.p. engine is of the inverted type and is called the "Gipsy III."

The fuselage of the "Puss Moth" is of rigid and robust welded steel structure, built in sections bolted together for ease of replacement and repair. The wings are of wooden construction and may be folded easily and quickly. The cabin provides comfortable accommodation for two occupants, the pilot normally being seated in front with the passenger seated directly behind him. With this arrangement full dual control is provided, and the machine may be used for instructional purposes. When desired, the controls in the rear seat may easily be detached in order to make room for an additional passenger

The "Puss Moth" has been specially designed for long range touring at high speed. Ample luggage accommodation has been provided, this including provision for the carriage of golf clubs, fishing tackle, guns, cameras, rations, picnic baskets and the like.

The engine fitted to the machine has been designed to run in all circumstances on ordinary commercial No. 1 petrol and mineral oil of the kind obtainable at any automobile garage. It is an air-cooled four-cylinder inverted unit and represents a direct development of the 100 h.p. "Gipsy I" fitted as standard into the open cockpit "Gipsy Moth." The employment of an inverted type of engine has many advantages, the most important being unrestricted vision ahead, exclusion of fumes from the cabin and a marked degree of silence in operation.

The "Puss Moth" has a remarkably flat gliding angle. While this is a great advantage in the rare event of a forced landing having to be effected, it is inconvenient in making a normal landing, and therefore the undercarriage compression struts may be swivelled broadside on to the wind in order to act as an air brake. This reduces the top speed of the machine by about 35 m.p.h.

The "Puss Moth" has an overall length of 25 ft., which is increased to 26 ft. 3 in. when folded ready for garaging. The wing span is 36 ft. 9 in. open, and 13 ft. when folded. It is 1,150 lb. in tare weight, and the all-up weight is 1,900 lb. A maximum speed of 128 m.p.h. may be attained near the ground: the cruising speed is 100 to 110 m.p.h., and the stalling speed 45 m.p.h. The rate of climb from ground level is 660 ft. per minute, and the service ceiling 15,000 ft. When fitted with two petrol tanks, each of 11 gallons capacity, the machine has a range of cruising speed of 460 miles. If desired, two tanks of different sizes, one of 11 gallons and the other of 17½ gallons capacity, may be fitted. The cruising range then is increased to 620 miles. If the machine is required for still longer flights, two tanks each of 17½ gallons capacity are available. These enable the machine to work with a cruising range of 760 miles.

The petrol consumption of the machine necessarily varies according to wind and other conditions. At a cruising speed of approximately 100 m.p.h. however, an average of 22 m.p.g. is obtained.

The price of the "Puss Moth" with a land undercarriage is £1,000. If desired it may be converted into a seaplane by fitting with floats, when the price is increased by £250.

THIS MONTH'S AIR STORY

Pilot: **"I was just passing over the tops of the mountains, when I found that my engine was missing."**

Listener: **"Good gracious! Who could have stolen it without your knowing?"**

Giant Air Beacon at Calgary

The Hudson's Bay Company has decided to erect on the roof of their Calgary store a 3,000,000 c.p. aeronautical beacon, that will be visible from points at distances of up to 130 miles. Forty neon tubes, each 20 ft. in length are employed in it. They will be arranged vertically around a special tower above the store.

A similar beacon was erected on the roof of the Winnipeg store of the Company, a photograph of this being published on page 359 of the "*M.M.*" for May. Others are to be placed on the remaining stores of the Hudson's Bay Company, and these will constitute a remarkable feature in the development of aviation and the air-mail service in western Canada. The intensity of the Calgary beacon exceeds by 1,000,000 c.p. that of the one at Winnipeg, which previously was described as the greatest in the British Empire.

Automatic "Observer" for R.A.F

The Royal Aeronautical Establishment at Farnborough has conducted a series of experiments with what is described as an "automatic observer." When a test pilot is flying a new machine he usually notes the readings of his instruments on a writing pad strapped to his knee, and naturally it is impossible for him to make simultaneous records of a large number of indications. No trouble of this kind is experienced in aeroplanes carrying the "automatic observer," and the pilot may devote his attention entirely to flying the machine.

In the new apparatus, the instruments are carried at the bottom of a light-proof box, the base of which is well illuminated. At the top of the box, a cinematograph camera is fixed. The film in this is set in motion by pressing an electric push-button that starts the clockwork mechanism operating the camera. At the same instant the lights inside the box are switched on, and thus a perfect photographic record is obtained that afterward may be studied at leisure.

If desired an automatic interrupter may be fitted in order that photographs may be taken at regular intervals instead of continuously.

British Engine Helps to Make Speed Record

A world's speed record for two-seater light aeroplanes weighing up to 800 lb. recently was made by a "D.18" type machine of the Darmstadt Flying Academy, the aeroplane being fitted with a 100-110 h.p. Armstrong Siddeley "Genet Major" engine. A distance of 62.5 miles was covered at a speed of 134.3 m.p.h. A short time previously the same machine had set up new figures for the world's altitude record for machines of this class by attaining a height of 24,819 ft.

An interesting proof of the popularity of British aero engines abroad is given by the fact that five German machines participating in the 1930 Challenge De Tourisme Aériènne are fitted with British engines. Two Junkers "Junior" type A.50 light aeroplanes taking part are equipped with 80-88 h.p. Armstrong Siddeley "Genets," as also are two Klemm machines, the fifth machine being the one that now holds the speed record noted in the previous paragraph.

New Type "Pterodactyl"

An improved form of the "Pterodactyl," or tail-less aeroplane designed by Capt. G. T. R. Hill, is now being manufactured at the Westland Aircraft Works, Yeovil. It is expected that the first machine will shortly be completed. It is of the cabin monoplane type and will be able to seat three people.

The "Take-about Two" Portable

Build this Simple Radio Set for the Holidays!

By James S. Garside

The two-valve portable receiver described in this article is just the thing to take away on your holidays. It is entirely self-contained, and will actually receive signals while it is being carried in the hand, as is shown in the illustration on the left.

THE summer months are always associated with holidays by the sea and in the country, and with the many forms of sport and out-door amusement that the warm weather allows. During even the best of holidays, however, there are nearly always a few periods when, owing to rain, for instance, time is liable to drag. These periods may be brightened up immensely if we have a portable wireless receiver at hand, and are thus able to listen to broadcasting. Commercial wireless portable sets, using four or even five valves, are costly; but a simple receiver that will give good reception with one or more pairs of telephones is quite inexpensive to build, and in many cases meets all requirements.

The receiver described in this article has been named the "Take-about Two," as it uses two valves and is absolutely self-contained and therefore really portable. The chief features of the design are its simplicity of construction and operation and its cheapness, and along with these features there has been maintained a high standard of efficiency. The outfit possesses also the great advantage of being light in weight. Complete with batteries and telephones, it weighs only 15 lb., and thus it may be carried over quite long distances without difficulty. The whole outfit can be built with the aid of a screwdriver, a pair of pliers and a bradawl, so that Meccano boys should find the work of assembly quite simple.

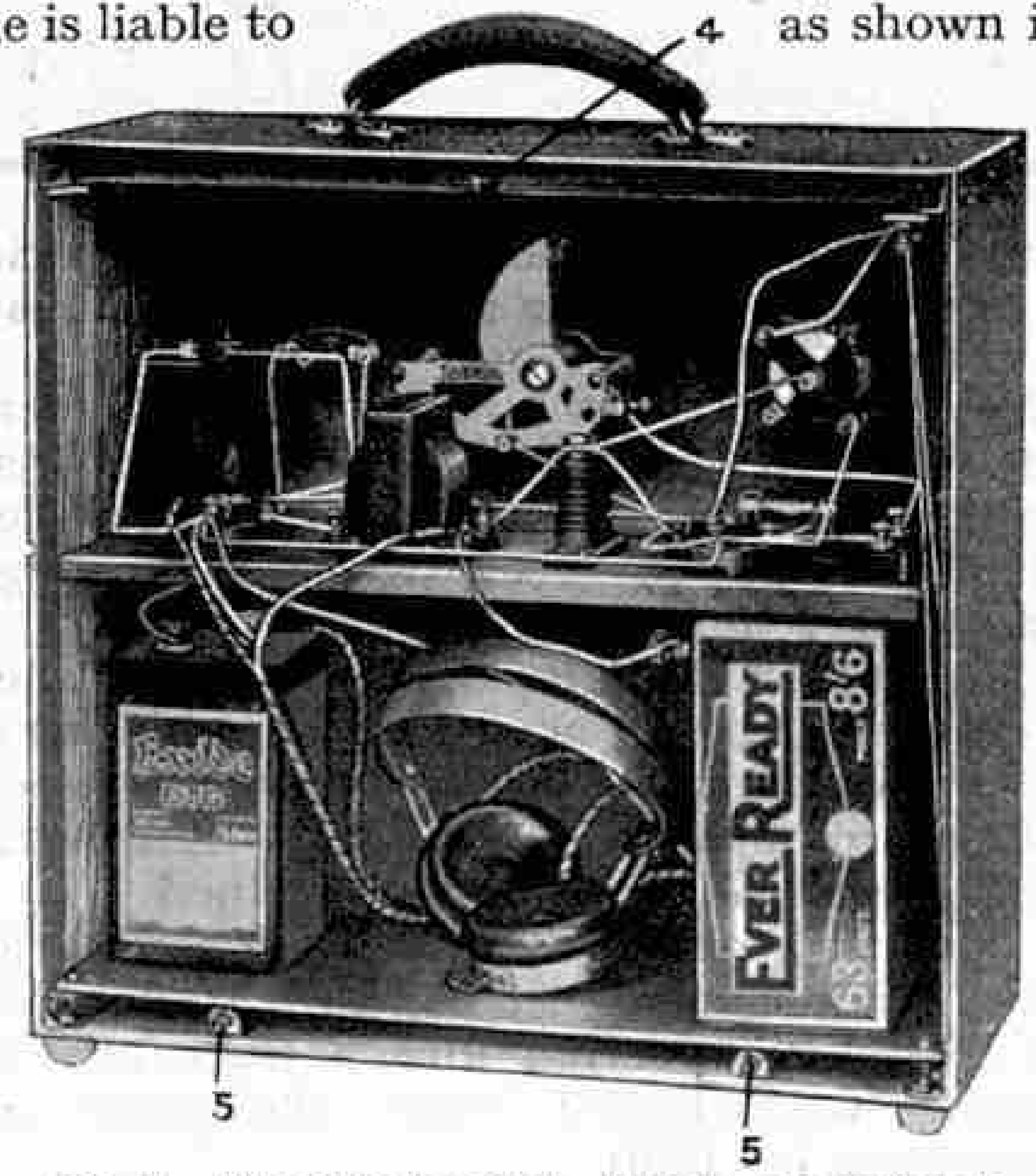


Fig. 1. The interior of the "Take-about Two" with back removed.

The Components and Materials

The following list includes the whole of the components and materials that are required to construct the complete outfit. Provided that the parts specified are employed, the total cost will not exceed £4/10/–. Parts of different type from those specified may be employed if desired, provided, of course, that they fit into place without necessitating any serious alteration of the design. If other parts are used, however, the cost may be slightly increased.

The materials needed for the case and the frame aerial are:—Seven sq. ft. of $\frac{3}{16}$" 3-ply wood (Hobbies); Piece of ⅜" Wood 13"×5"; Four Meccano 5½" Angle Girders; 15 Meccano ½"×½" Angle Brackets; 36 Meccano ⅜" Bolts; Six Meccano ½" Bolts; 48 Meccano Nuts; Three Meccano 6 B.A. Bolts; Three Meccano Insulating Bushes; Three Insulating Washers; Three Meccano 6 B.A. Nuts; Three Meccano 6 B.A. Terminals; 2 oz. of No. 30 D.C.C. Copper Wire; Meccano Threaded Boss; Leather Handle complete with fixing lugs; Four Rubber "Toes."

For the set proper the following components will be required:—.0005-mfd. Variable Condenser (Lotus); .00013-mfd. Differential Reaction Condenser (Ormond); H.F.Choke (McMichael); L.F. Transformer, Ratio 5:1 (Lotus); .0003-mfd. Fixed Condenser (Lissen); 3-megohm Grid Leak (Lissen); Grid Leak Holder (Lissen Combinator) Push-pull on-off switch (Lotus); Vernier Dial (Brownie); Two Valve Holders (Lotus); Coil of Connecting Wire (Glazite); 1.5-volt Grid Bias Battery (Siemens G.T.); Two Wander Plugs; Two Doz. ⅝" Round Head Brass Wood Screws; Four ft. Insulated Flexible Wire.

Now come the accessories, which form the most costly portion of the outfit:—"H.F." type two-volt Valve; "L.F." type 2-volt Valve; 63-volt High Tension Battery (Ever Ready "Portable One"); 2-volt Low Tension Accumulator (Exide DTG); Pair of Telephones.

Construction of the Case

The case is composed of seven pieces of $\frac{3}{16}$" plywood, and these may be cut to size with a tenon saw or a fretsaw. If it is not desired to tackle this part of the work, the exact size of the pieces of wood required may be stated when ordering and, for a small additional charge, they will be cut accurately ready for assembly.

Two pieces of plywood 14"×13½" are required for the front and back; two pieces 14"×5½" for the top and bottom, and two pieces 13⅛"×5½" for the sides. In addition, a piece of plywood 13½"×5½" is needed for the "false bottom" on which the batteries rest.

The plywood panels forming the sides and ends of the case are held together by Meccano 5½" Angle Girders secured in place by Meccano ⅜" Bolts, six Bolts being used at each corner, as shown in the exterior view of the set (Fig 2).

An Angle Girder should first be placed against the sides and end pieces, and the positions of the holes marked with a pencil. The holes may next be bored with a medium-size bradawl and the four pieces of wood bolted together. In order to prevent the Bolt heads on the bottom of the case from causing damage when the set is stood on a table, four rubber "toes" should be slipped on to the Bolts placed at the four corners of the plywood board, as can be seen in Fig. 1.

A Meccano ½"×½" Angle Bracket is mounted by means of a ⅜" Bolt close to the back edge of the top of the case, and carries a ⅜" Bolt 4 (Fig. 1), which projects beyond the edge of the case. Two further ⅜" Bolts 5, with their heads turned outward, are also secured in a similar manner to the bottom back edge as shown in Fig. 1. These three Bolts provide the fastenings for the removable back piece.

Four ⅜" Bolts are also mounted on Angle Brackets secured at the front edge of the case so that their shanks can be passed through the holes A, B, C, D, in the front panel (Fig. 4).

The leather carrying handle may also be bolted in position at this stage by means of ½" Bolts and Nuts.

Winding the Frame Aerial

The frame aerial is wound round two small supporting strips secured to the inside of the case at the top, and the edges of the "false bottom" that is held a short distance above the bottom of the case.

The upper supports consist of $\frac{3}{16}$" plywood strips 5½"×⅜", and five holes should be bored in one of these as shown in Fig. 4. It is not necessary to bore the terminal holes in the second strip, the two corner holes only being required. After the holes have been bored, three Terminals may be mounted on 6 B.A. Bolts passed through the holes

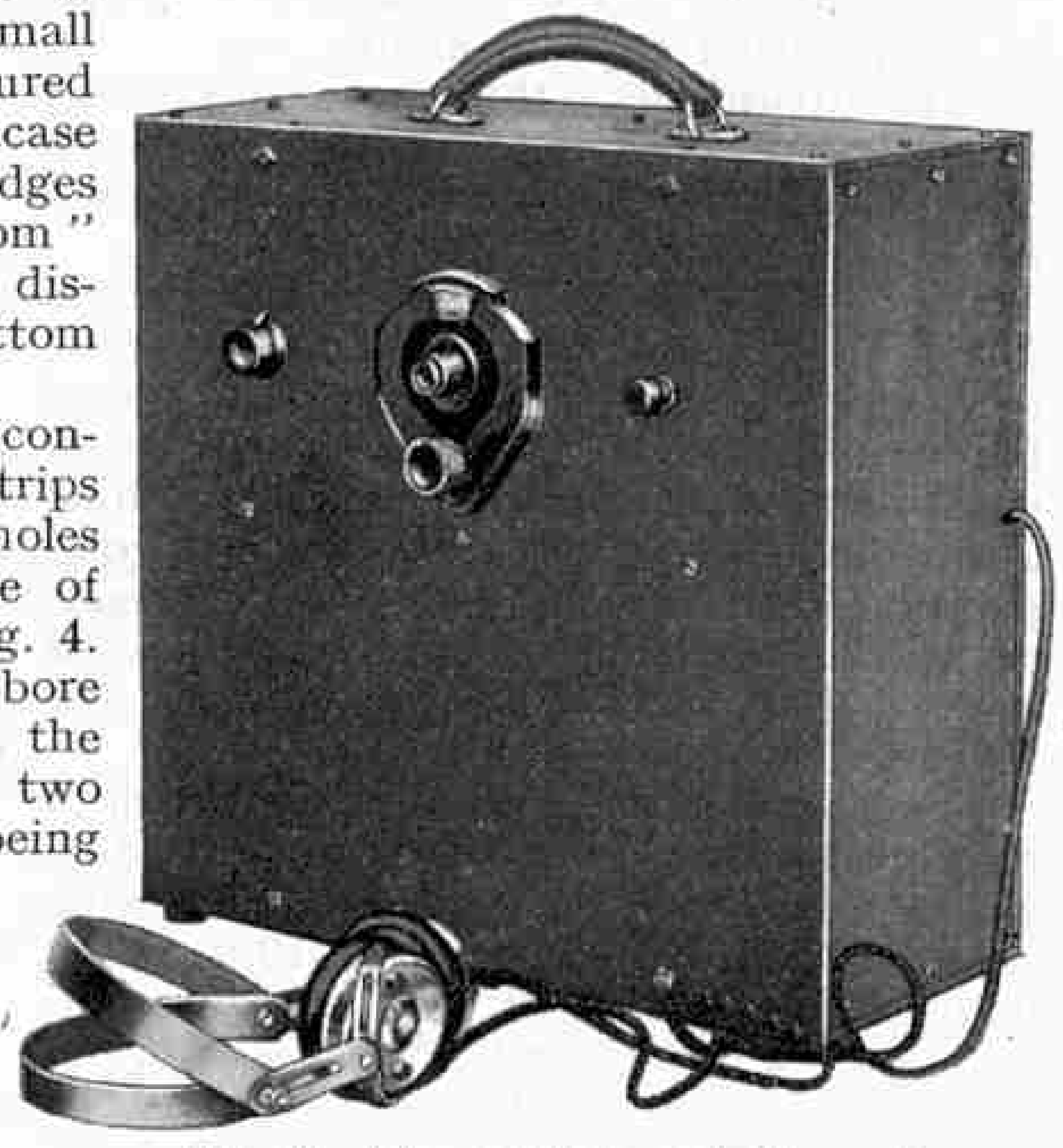
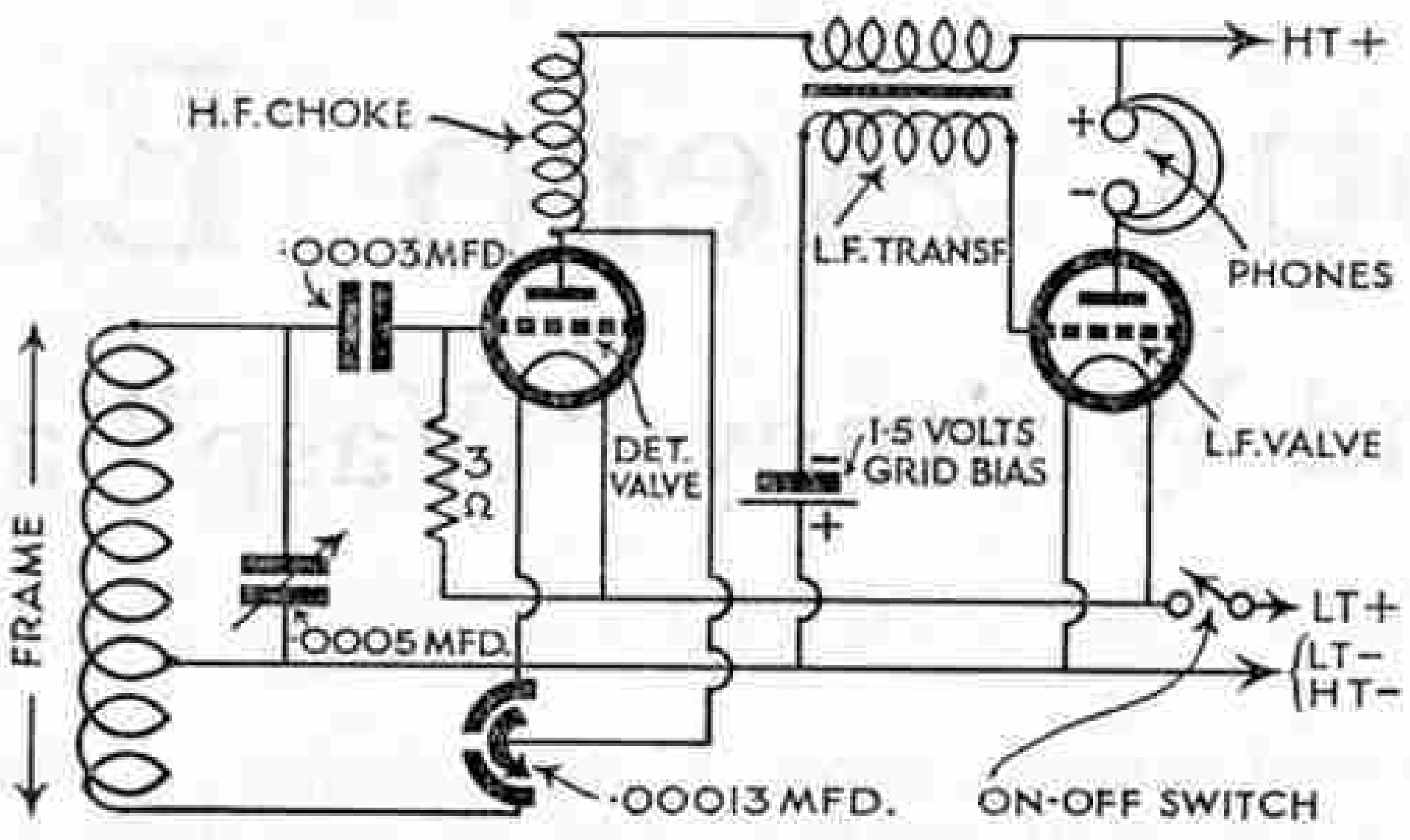


Fig. 2. The complete portable receiver ready for listening.

in the strip, an Insulating Bush and Washer being slipped on to each 6 B.A. Bolt so that the complete terminal is insulated from the wood. Each supporting strip may then be secured to an Angle Bracket, which in turn is secured on one of the Bolts holding an Angle Girder in place at the front edge of the case.

A hole should be bored at each corner of the "false bottom" in a similar manner to the holes in the supporting strips, and the board then secured to the case at the front edge by means of Angle Brackets.



Theoretical circuit diagram of the "Take-about Two" portable.

The winding of the frame aerial should be commenced by baring the end of the 30 gauge wire and twisting it several times around the 6 B.A. Bolt forming the shank of terminal 3. The wire should then be passed round the supporting strips and "false bottom" in a clockwise direction until 17 turns have been completed, each turn being separated slightly from the adjoining one. On completion of the 17th turn the insulation should be removed from the wire with a penknife for about 1″, and the bare portion twisted around the shank of terminal 2. The winding should then be continued in a clockwise direction until a total of 22 turns has been wound on, when the wire may be cut and the bare end anchored securely to terminal 1. To complete the frame aerial, it is only necessary to fasten the supporting strips and "false bottom" at the back edge of the case by means of Angle Brackets and ⅜″ Bolts.

Two small slots are cut in the bottom edge of the back of the case and these engage with the projecting shanks of the Bolts 5 (Fig. 1). A hole is also bored near the top edge so that the shank of the Bolt 4 can be passed through. The back may be locked in place when required by screwing a Threaded Boss on to the projecting shank of the Bolt 4.

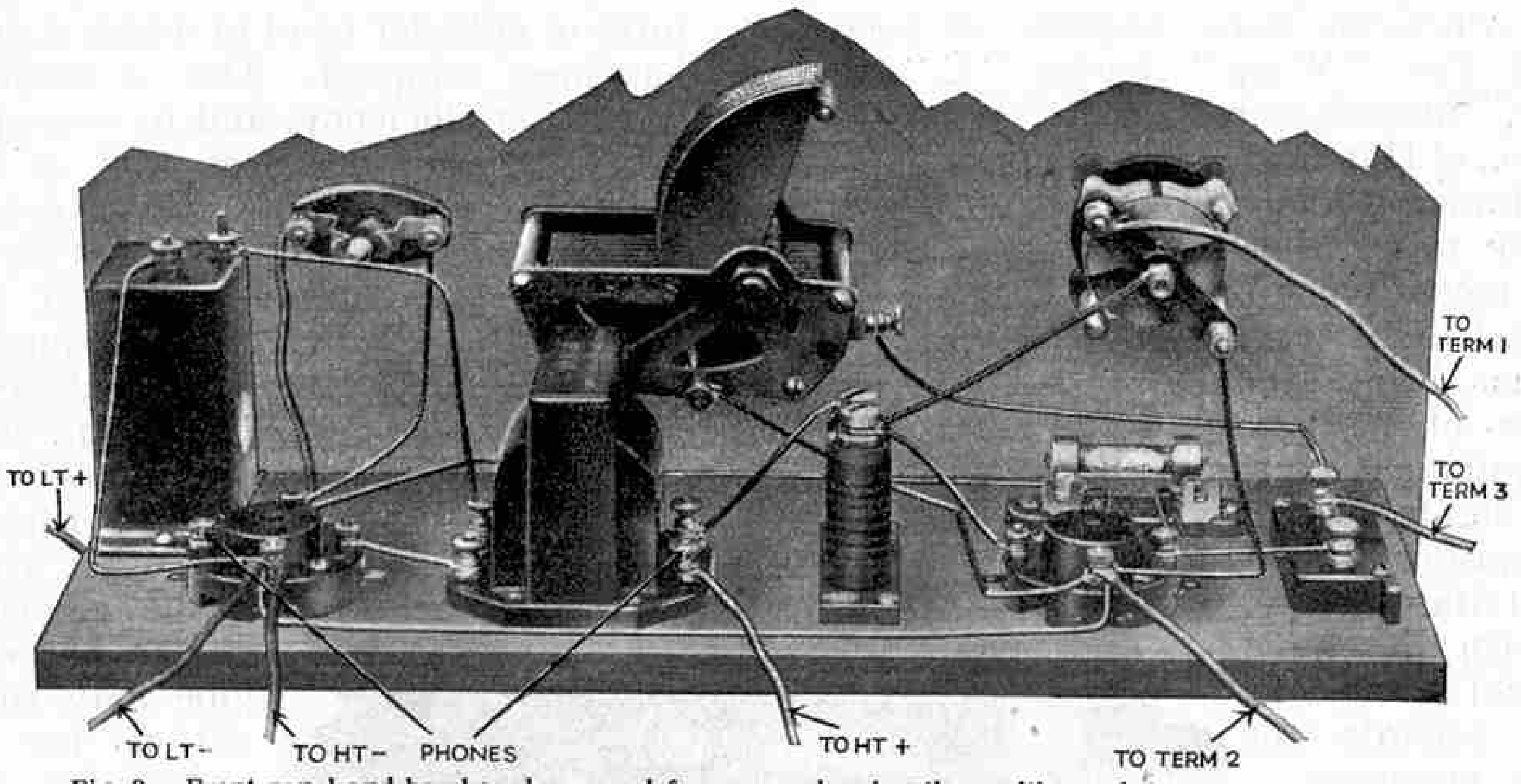


Fig. 3. Front panel and baseboard removed from case showing the positions of the components and connecting wires.

Several holes are bored in the front panel, the positions for these being indicated in Fig. 4. The holes for the tuning and reaction condensers and the push-pull switch are each ⅜″ diam., and if no tool is available for drilling to this size the holes may be bored with an ordinary bradawl and afterwards enlarged to the correct size by means of a heated poker. At this stage the external surface of the case may be finished either by staining and wax polishing or by treating the wood with black or brown cellulose lacquer such as "Brushing Belco," "Luc," etc.

The baseboard on which most of the components are mounted consists of a piece of ⅜″ wood 13″ × 5″, and this is secured at right angles to the front panel by means of three ⅝″ wood screws passed through the holes E, F and G (see Fig. 4).

The tuning and reaction condensers, vernier dial, and push-pull switch can now be secured in their respective positions on the panel, and the remainder of the components screwed down on the baseboard with ⅝″ wood screws in the positions shown in Fig. 3.

After all the components have been secured in place, the process of "wiring up" can be carried out with insulated connecting wire such as "Glazite." The insulated covering should be removed from the ends of each separate lead for ½″, and the bare portions bent into a loop with a pair of pliers; the looped ends are clamped securely under the terminals of the components.

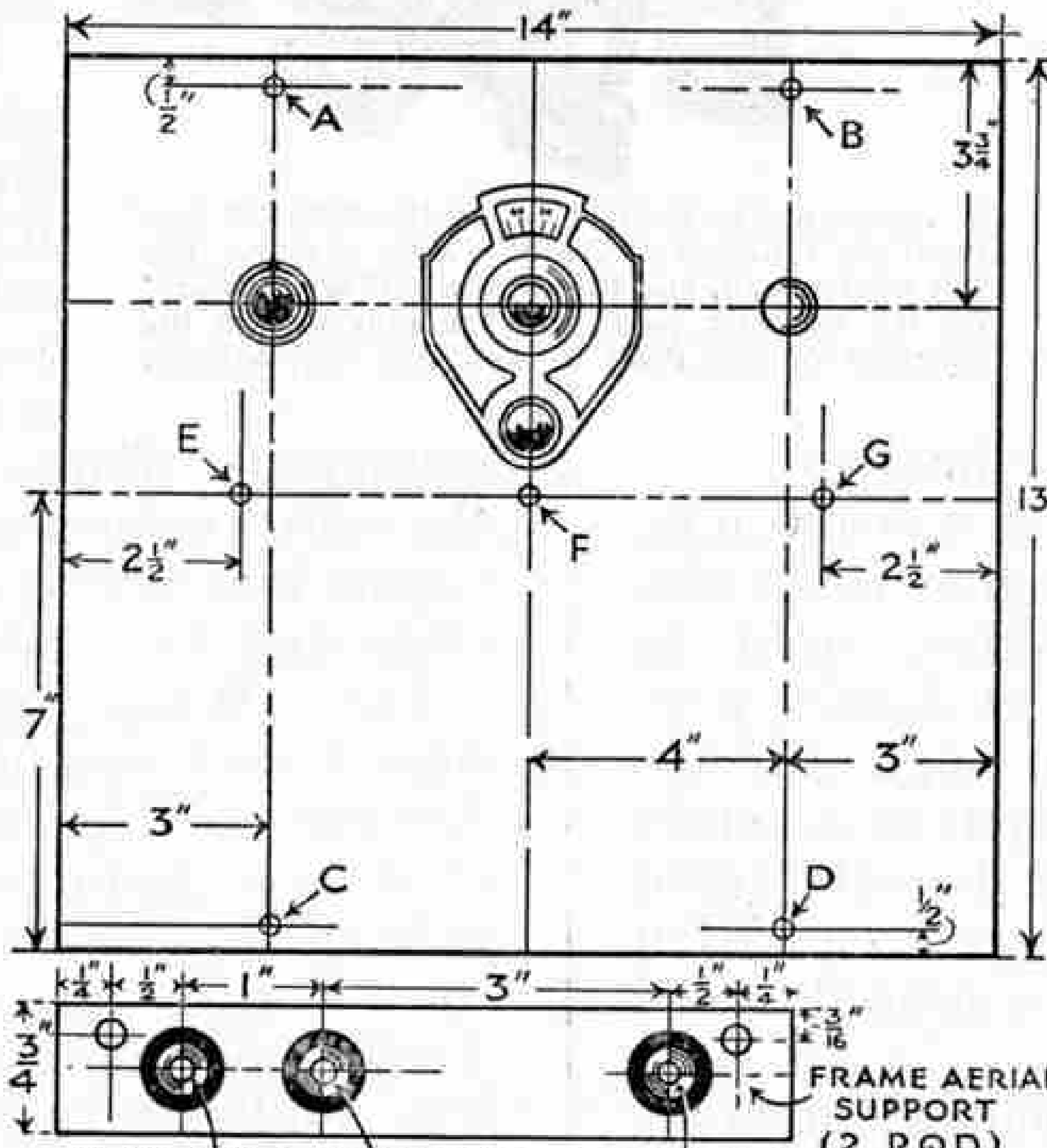


Fig. 4. Diagram showing front panel layout and frame support dimensions.

The positions of the various wires can all be seen in Fig. 3 and little difficulty should be experienced in completing the wiring.

In order to eliminate any chance of a mistake occurring, however, the "point-to-point" connections are given below. By comparing this list with the finished wiring an effective check on the connections can be made.

"The Point-to-Point" Connections

Inside terminal of .0003 Fixed Cond. to side terminal of .0005 Variable Condenser; Outside term. of .0003 Cond. to "G" term. on first valve Holder; "G" term. on first Valve Holder to one term. on Grid Leak Holder; Inside "F" term. on first Valve Holder to second term. on Grid Leak Holder; Second term. on Grid Leak Holder to inside "F" term. of second Valve Holder; Outside "F" term. of first Valve Holder to outside "F" term. of second Valve Holder; Outside "F" term. of first Valve Holder to lower outer term. of .00013 Reaction Condenser; Outside "F" term. of first Valve Holder to end term. of .0005 Variable Condenser; "P" term. of first Valve Holder to outer term. of H.F. Choke; Outer term. of H.F. Choke to centre term. of .00013 Reaction Condenser; Inside term. of H.F. Choke to "P" term. on L.F. transformer; "G" term. on L.F. Transformer to "G" on second Valve Holder; "—" term. of 1.5–volt "G.B." Battery to "G.B." term. on L.F. Transformer; "+" term. of "G.B." Battery to outside "F" term. of second Valve Holder; Inside "F" term. of second Valve Holder to term. on L.T. Switch.

Flexible leads: Term. of L.T. Switch to "+" term. of Accumulator (through hole in base) Outer "F" term. of second Valve Holder to "—" Socket of H.T. Battery (end fitted with black wander plug); Outer "F" term. of second Valve Holder to "—" term. of Accumulator; "H.T. +" term of L.F. Transformer to 63-volt socket of H.T. Battery (end fitted withred wander plug); Outer "F" term of first Valve Holder to term. 2 on frame; Inner term. of .0003 Fixed Condenser to term. 3 on frame; top outer term. of .00013 Reaction Condenser to term. 1 on frame.

The ends of the flex leads should be bared in the same way as the insulated wires and the ends looped so that they can be secured rigidly under the terminals. The flex lead from the push-pull switch to the accumulator "+" terminal passes through the baseboard, and a small hole should therefore be bored through the wood to enable this to be done. A red wander plug should be secured to the free end of the H.T. "+" lead and a black plug to the H.T. "—" lead.

After the flex leads have been secured to their respective terminals, the front panel with baseboard attached may be secured in position in the case. The projecting shanks of the four Bolts mounted at the front edge of the case pass through the holes A, B, C, D, in the front panel, and are held in place by four nuts.

The free ends of the flex leads at the right hand side of the baseboard can now be attached to the terminals 1, 2, and 3 of the frame aerial.

The constructional work may now be said to be complete, and it only remains to couple up the batteries and telephones, and insert the valves so that a "try-out"

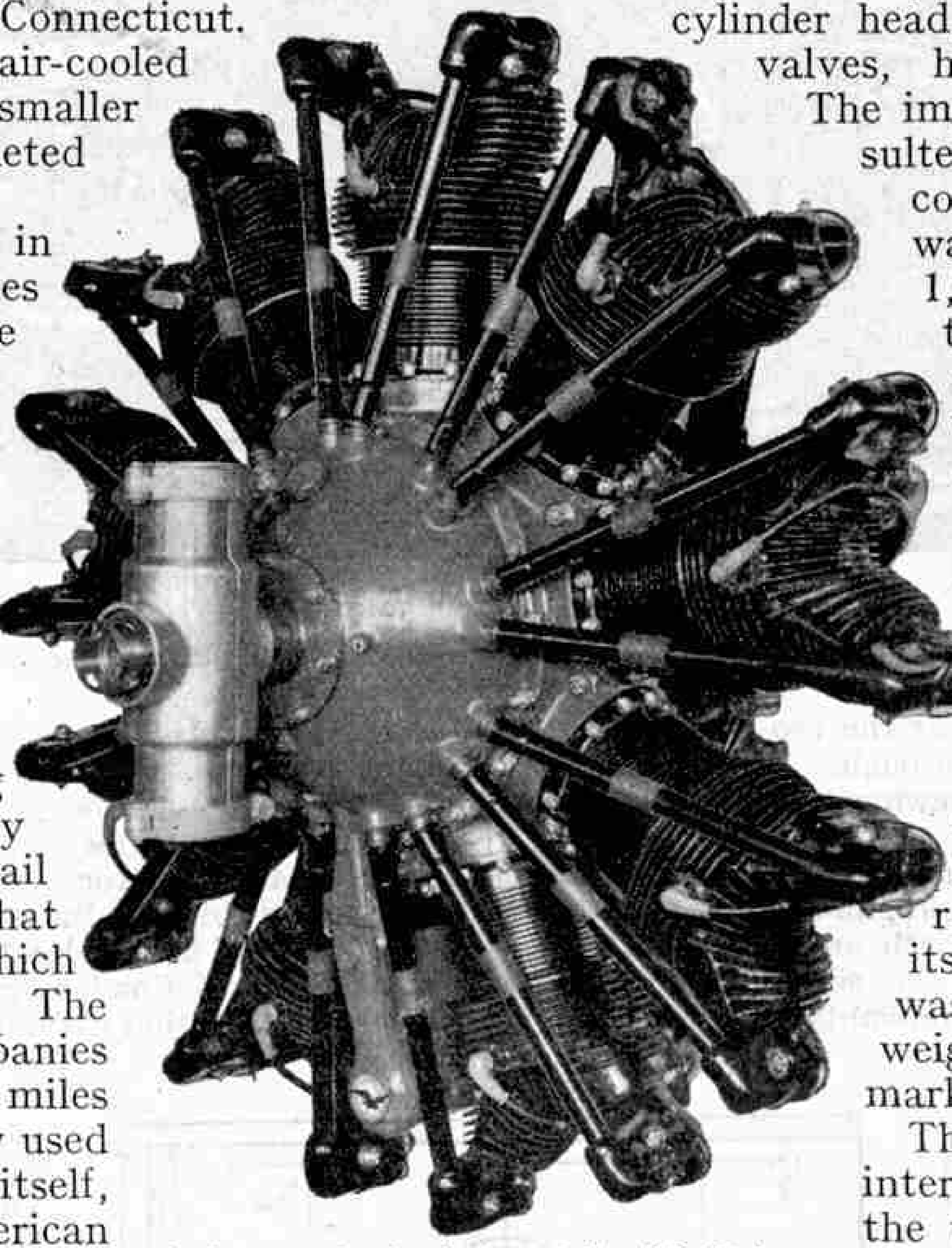
(*Continued on page 544*)

Famous Aero Engines

XII.—The Pratt and Whitney "Wasp" and "Wasp Junior"

In previous articles in this series only one famous aero engine of non-British origin has been dealt with. This is the Wright "Whirlwind," a full description of which appeared in the issue of the "*M.M.*" for July, 1928. This is a nine-cylinder air-cooled radial engine that attained special prominence when Col. Lindbergh made his celebrated flight across the Atlantic Ocean, for his Ryan monoplane was fitted with one of these engines.

In the present article we propose to deal with two other interesting American aero engines of recent design. These are the "Wasp" Series "C" and the "Wasp Junior," manufactured by the Pratt & Whitney Aircraft Co., of Hartford, Connecticut. Both are nine-cylinder radial air-cooled engines of modern type, the smaller engine having only recently completed its official bench and flight tests.



A three-quarter front view of the 420-450 h.p. Pratt & Whitney "Wasp" aero engine. For this photograph, and that of the "Wasp Junior" on the opposite page, we are indebted to the courtesy of the Pratt & Whitney Aircraft Co.

The "Wasp" has been used in 28 different makes of aeroplanes and is standard equipment of the single-seater fighters and two-seater observation aeroplanes in the United States Navy. Aircraft fitted with it have captured ten world's records, including altitude records for both land and sea machines.

The position occupied in the United States by this engine is shown by the fact that, according to figures recently published by the makers, 12 of the 21 air mail companies now operating in that country employ aircraft in which "Wasp" engines are fitted. The aeroplanes of one of these companies alone cover nearly 3,000,000 miles yearly. The engines are not only used with success in the United States itself, but also in other parts of the American continent, including Alaska and northern Canada, Nicaragua in Central America, and several South American countries, and they have proved equally serviceable in sub-arctic and tropical climates.

The "Wasp" Series "C" engine is of 420 450 h.p., the lower rating being given to the engine when employed for commercial purposes. When used in military aircraft the rating is 450 h.p. at 2,100 r.p.m. A supercharged model is available for high altitude work, and this gives the same power output at a height of 5,000 ft., as the ordinary type of engine does at ground level. The use of a supercharger involves no addition to the weight of the engine. If desired a geared model also may be obtained.

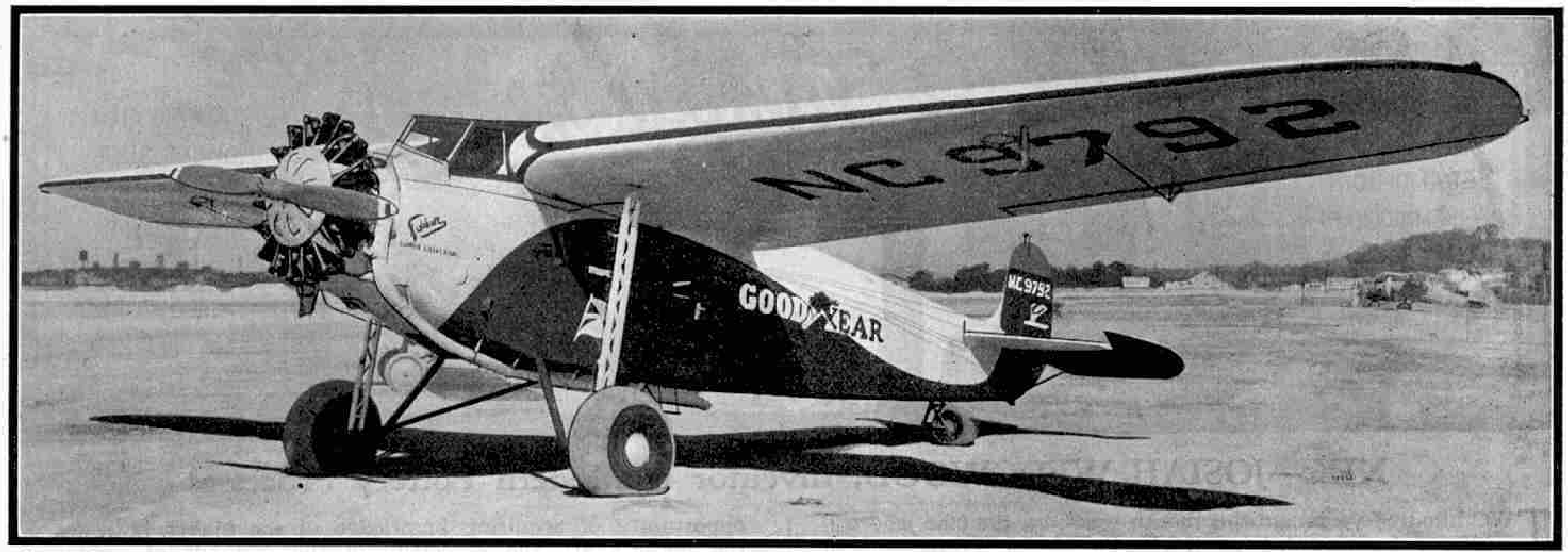
The present "Wasp" is a development of previous engines manufactured under the same name by the Pratt & Whitney Aircraft Co. Ltd. It closely follows the design of its predecessors and incorporates the more valuable of the original features that helped to establish their high reputation. These include the forged aluminium crankcase, enclosed valve gear in patented housings integral with the cylinder head, a one-piece master connecting rod and a divided crankshaft. All accessories are placed at the rear of the engine.

Naturally improvements have been made in designing the present "Wasp." It is notable for an improved form of cylinder head in which a new method of finning has been adopted. This is responsible for increased cooling efficiency, and in consequence the life of the cylinder head, as well as that of the exhaust valves, has been considerably extended. The improvement in cooling also has resulted in better performance. For commercial purposes the old engine was rated at 400 h.p. when making 1,900 r.p.m., but as already noted this has now been raised to 420 h.p. at 2,000 r.p.m. In conjunction with other changes, the increase in the efficiency of the cooling system has ensured that the engine may run under flying conditions for 500 hours between successive complete overhauls.

The splendid performance and durability of the series "C" "Wasp" engine was shown in an official 50-hour United States Navy test. At an average speed of 2,080 r.p.m. the engine tested developed its full rated power. Its dry weight was 684 lbs., and thus the measured weight per h.p. was 1.47 lb., a remarkably low figure.

Throughout the test no repairs or internal inspections were made. During the whole period the engine operated at practically full throttle and the power output and fuel and oil consumptions were remarkably constant. At the conclusion of the test the engine was completely dismantled, when inspection showed that the only replacements necessary in order to bring the engine into first class condition again were three piston rings and two valve springs.

The "Wasp Junior" is the latest engine to be designed and manufactured by the Pratt & Whitney Aircraft Co. As its name suggests, it is a smaller engine of similar character to the one already described. In external appearance and in general design it resembles the "Wasp" very closely. The cylinders of the "Wasp Junior" naturally are smaller than those of the "Wasp," bore and stroke being $5\frac{3}{16}$ in., while those of the "Wasp" are $5\frac{3}{4}$ in. It will be noted that in each case the bore and stroke are equal. The fins on the cylinder



Courtesy] [Goodyear-Zeppelin Corporation

A Fokker " Universal " six-seater aeroplane owned by the Goodyear-Zeppelin Corporation of Akron, Ohio. The partially deflated Goodyear Airwheels should be noted.

barrel of the smaller engine are thinner and more numerous. The cylinder heads also are smaller and the diameters of the valves slightly less than those of the more powerful engine.

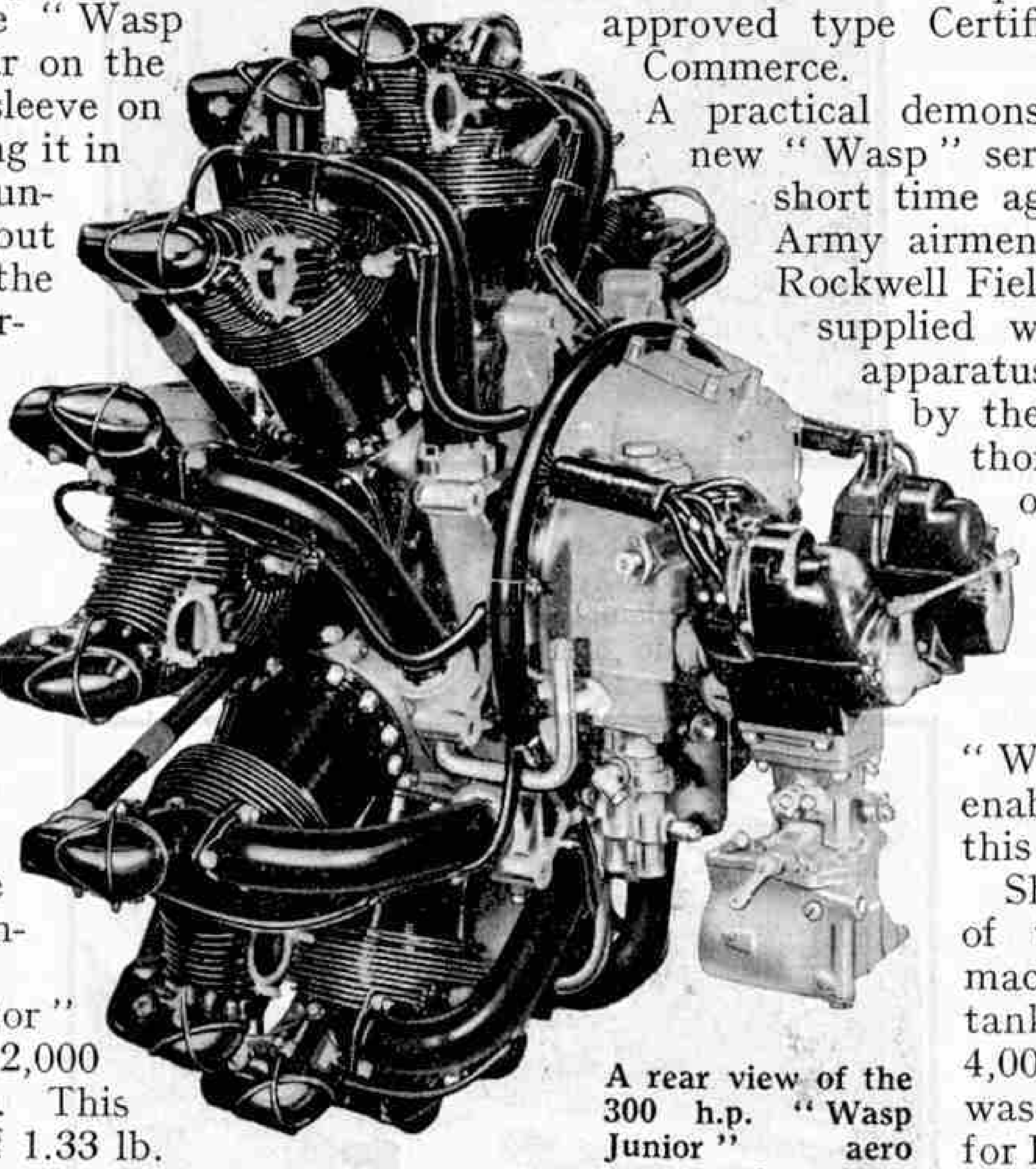
The pistons of the two engines are of the same design. They have concave heads, and three compression rings and one scraper are fitted. There is also a slight difference in the sizes of the crankshaft, the diameter of the crankpin of the " Wasp " being $2\frac{5}{8}$ in., while that of the " Wasp Junior " is $2\frac{1}{2}$ in.

An interesting feature of the " Wasp Junior " is that the driving gear on the crankshaft is integral with the sleeve on which the cam rides. By making it in this manner, cam adjustment is unnecessary, for timing is carried out by simply taking care to mesh the teeth that are marked for the purpose. When this has been done no further adjustment can be made.

The oil sump on the " Wasp Junior " is smaller than the one used on the larger engine, and has no pressure oil pipe running through the upper part. Instead, a drilled passage in the main crankcase carries the pressure oil from the rear to the front of the engine. This system shortens the path of the oil travel and simplifies connections.

The direct drive " Wasp Junior " has a weight of 550 lb., and at 2,000 r.p.m. its rated output is 300 h.p. This gives a weight to power ratio of 1.33 lb. for every horse power developed, with a fuel consumption of about 22 gallons per hour. The overall length of the engine is $41\frac{1}{16}$ in., while its diameter is $45\frac{3}{4}$ in.

As in the case of the " Wasp " itself, the " Wasp Junior " has been subjected to official bench tests carried out under the supervision of United States Army and Navy Inspectors. These included the 50-hr. running test. This usually is taken in ten periods of five hours each, but the " Wasp Junior " was set the more difficult task of running for five ten-hour periods at full throttle.



A rear view of the 300 h.p. " Wasp Junior " aero engine.

The test was completed in five working days. During the run no forced stops or difficulties of any kind were experienced and no adjustment was necessary. Later the engine was installed in an aeroplane and flown for ten hours. The engine was called upon for arduous work under all conditions, including climbs to the ceiling of the aeroplane at full throttle, straight runs at top speed, dives and other tests of great severity. In these it behaved perfectly and was awarded the approved type Certificate of the Department of Commerce.

A practical demonstration of the merit of the new " Wasp " series " C " engine was given a short time ago by a number of American Army airmen. A squadron stationed at Rockwell Field, San Diego, California, were supplied with a new type of oxygen apparatus for altitude flying and ordered by the War Department to test it thoroughly. Accordingly, the officer in command of the squadron flew in formation with two lieutenants to a height of 25,000 feet in Boeing P-12 type single-seater fighter biplanes. The supercharged " Wasp C " engines employed enabled the three airmen to attain this height without difficulty.

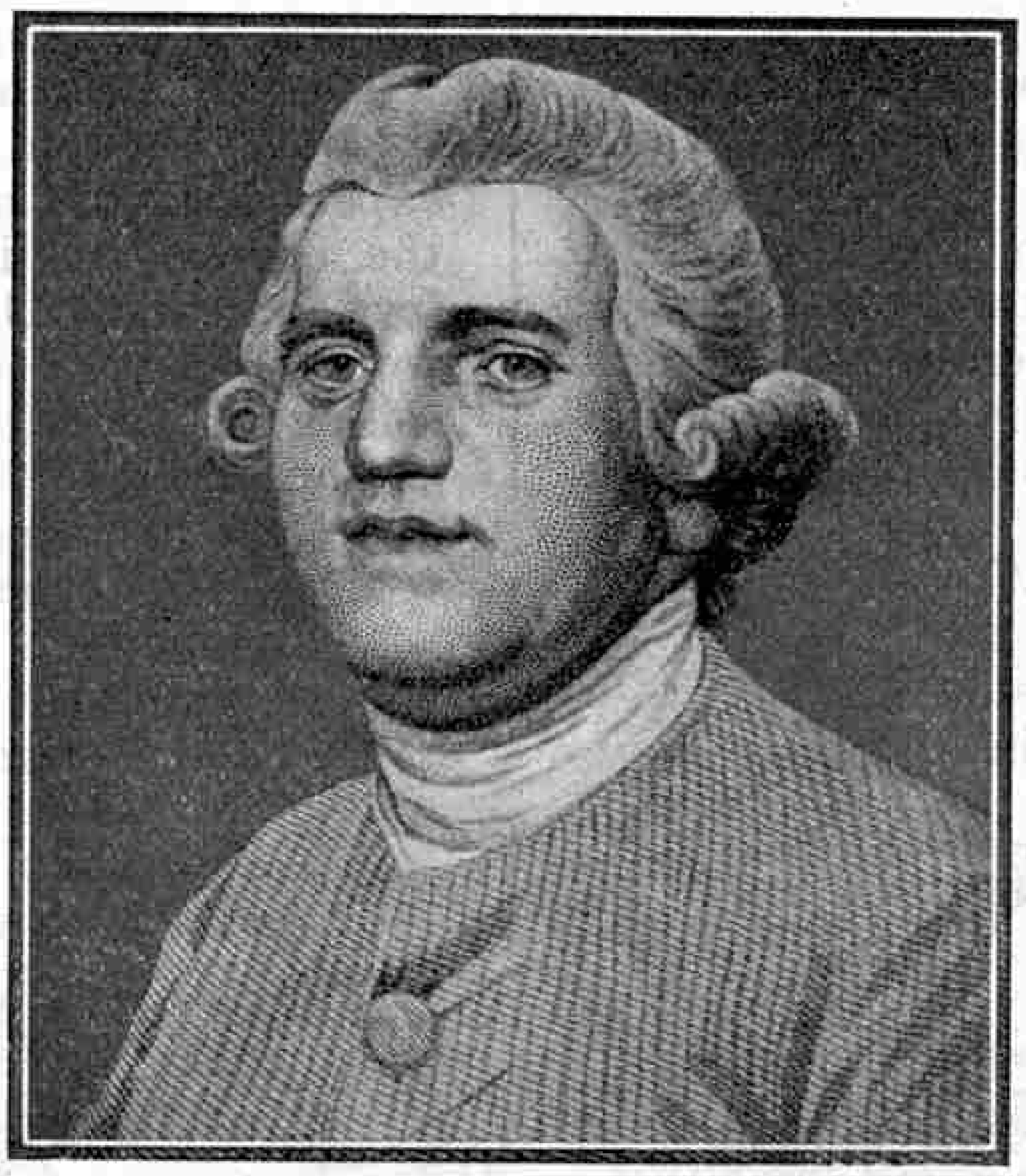
Shortly afterward another officer of the squadron, in a similar machine, but fitted with auxiliary tanks, exceeded this altitude by 4,000 ft. Even this record, however, was not allowed to stand long, for Lt. N. H. Ives had the auxiliary tanks taken off the machine in order to make a further attempt. The increased lift afforded by removing the tanks enabled Lt. Ives to attain an altitude of 30,000 ft., only to be beaten shortly afterward by another flyer who reached 30,200 ft.

It was thought that this height was the absolute ceiling to which the Boeing fighter could be driven by its " Wasp " engine. Even this has now been surpassed, however, for on the same machine as that with which the previous three records had been made Lt. G. R. Price reached a height of 31,700 ft.

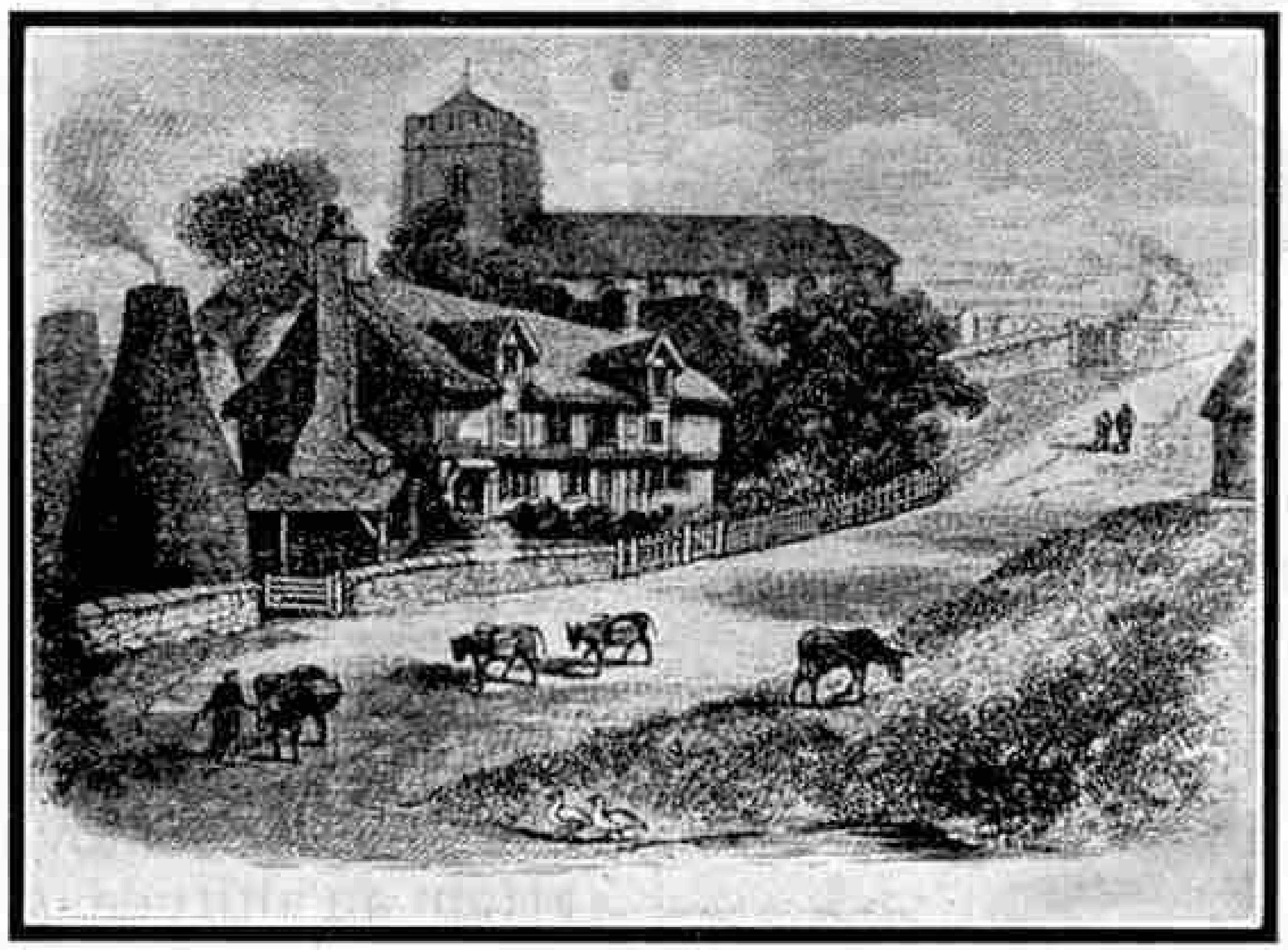
XIX.—JOSIAH WEDGWOOD, Inventor of Modern Pottery Processes

TWO hundred years ago this month was born the man who will always be regarded as England's Master Potter—Josiah Wedgwood. At the time when, as a boy of nine, he commenced his working life, the pottery industry of this country, which for centuries had been centred in North Staffordshire, was of little real importance and had few claims to artistic merit. By a remarkable combination of skill, dogged perseverance, and business ability, Wedgwood raised the industry not only to national but to international importance.

Josiah Wedgwood was born in July 1730, at Burslem in Staffordshire. The exact date of his birth is not known, but there is a record of his christening on 12th July at Burslem Parish Church. The Wedgwoods had been potters for many generations, and branches of the family had settled and carried on their trade in Yorkshire, Cumberland, Westmorland and elsewhere, in addition to the branch in Staffordshire. At the time of Josiah's birth his father was carrying on business as a potter at the old Churchyard Works next to Burslem Church.


Josiah Wedgwood.

When he was six years old the boy commenced a brief period of education at a school at Newcastle-under-Lyme where, according to the schoolmaster, he became "a fair arithmetician and master of a capital hand." His father's death in 1739 put an end to his schooling and at the age of nine he was set to work under his brother Thomas, who had succeeded to the father's business. Five years later he was apprenticed to his brother to learn the "Art, Mistery, Occupation or Imployment of Throwing and Handleing." By the terms of his indenture his brother was to provide him with "Meat, Drink, Washing and Lodging, and Apparell of all kinds, both Linen and Woolen, and all other Necessaries, both in Sickness and in Health, Meet and Convenient for such an Apprentice."


The Churchyard House and Works where Wedgwood was born and served his apprenticeship.

Little is known of Josiah's life during the early part of his apprenticeship, but at the end of three years he was attacked by a serious illness, probably smallpox. He was laid up for a considerable time, and the disease left him with a permanent weakness of the knee that ultimately, in 1768, made it necessary to amputate the leg. It is interesting to note that the operation was performed under the supervision of Dr. Erasmus Darwin, grandfather of the great naturalist Charles Darwin.

Josiah appears to have worked diligently to master the art of "throwing," which was the most important operation in the forming of vessels. The thrower worked at the "potter's wheel," on the disc of which was placed a lump of moist clay. The wheel was turned by an assistant, and the thrower formed the vessel by hand, with the aid of guides to shape prepared for the purpose. The boy was not content with gaining skill in this direction, however, but took every opportunity of acquiring knowledge of the higher branches of the potter's art and especially of the methods of producing coloured wares. He spent so much time in experimenting that his brother became quite worried about it, and urged him to devote himself to more practical matters. At the conclusion of his apprenticeship he asked his brother to take him into partnership, but his request was refused, probably because his brother had little faith in experiments and declined to risk his money in doubtful schemes.

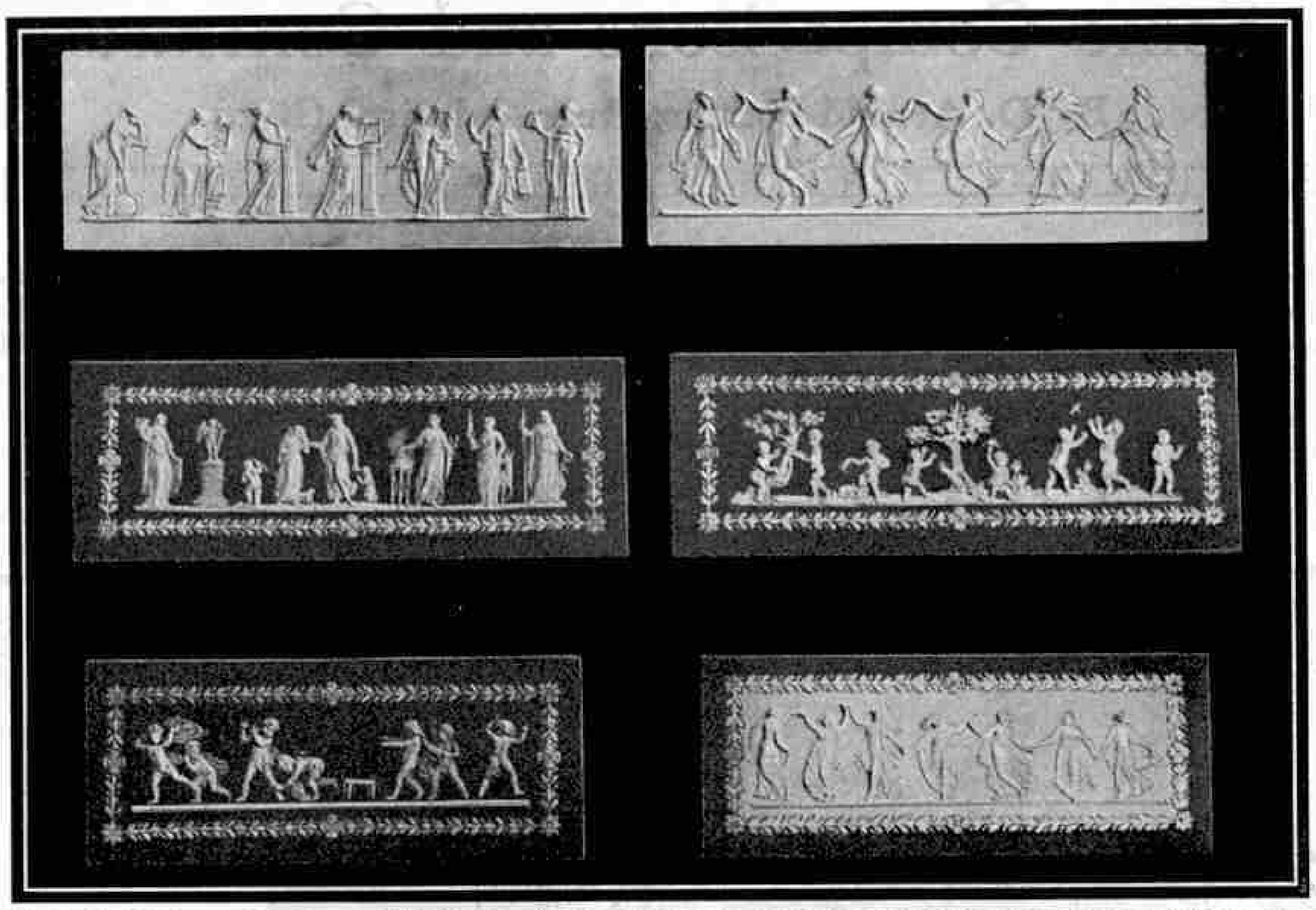
Shortly afterward Wedgwood entered into partnership with John Harrison, a tradesman of Newcastle-under-Lyme. Harrison was not himself a potter, but had invested money in a pottery in Stoke. He seems to have taken little interest in the wares produced, except from a purely money-making point of view, and his methods were so repugnant to Wedgwood that the partnership was dissolved after little more than a year. In 1754 Wedgwood found a new partner, Thomas Whieldon of Fenton Low, a successful potter and a man similar to Wedgwood in his love of experimenting and his scrupulously fair business methods. By the terms of the partnership Wedgwood was left free to pursue his experiments without any obligation to impart his results to his partner. During the last year of this partnership Wedgwood commenced an "Experiment Book," in which he recorded all his experiments and their results.

The researches carried out by Wedgwood during his partnership with Whieldon resulted in the production of the now famous Green Glaze ware. He did not patent this, and the ware was subsequently made by potters throughout Staffordshire. As a matter of fact Wedgwood only applied for one patent during the whole of his career, and in this instance, which concerned a method of encaustic painting, he seems to have yielded to the persuasions of his friends against his own inclinations. His view, frequently expressed in conversation with his friends, was that it would be selfish to keep his discoveries to himself. On one occasion he wrote:—"So far from being afraid of other people getting our patterns, we should glory in it, throw out all the hints we can, and if possible have all the artists in Europe working after our models."

The partnership with Whieldon terminated in 1759, and Wedgwood then started in business for himself, first at the small Ivy House Works, Burslem, and later at the considerably larger Brick House, also at Burslem. For the first few years he gave his attention almost exclusively to "useful" as distinct from "ornamental" ware, and in particular he strove to improve the quality and design of "Cream-Coloured" earthenware. At that time, as is the case to-day, the ware was decorated by printing or by painting with enamels, or by a combination of the two processes.

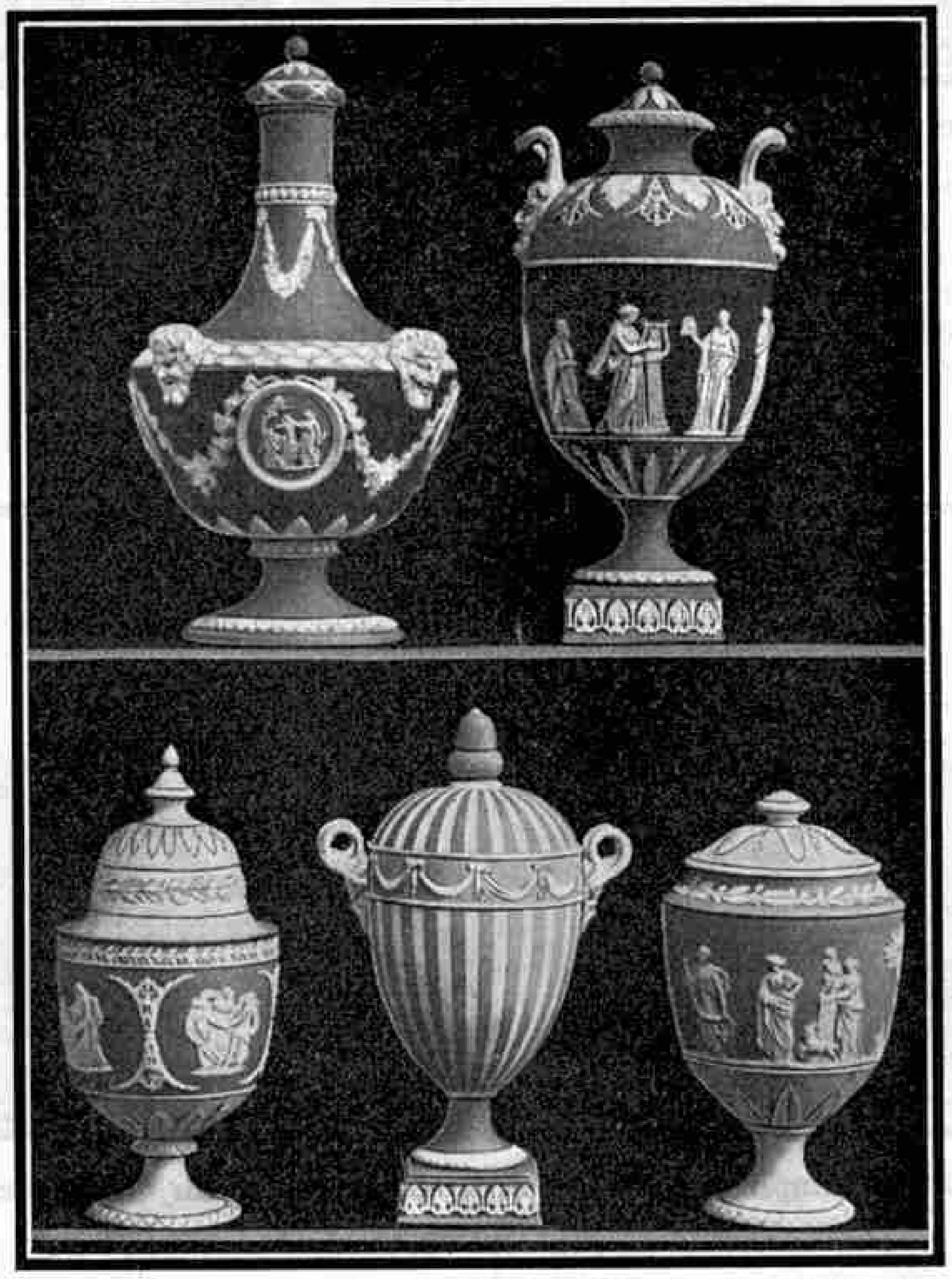
The painting was done locally, but the printing was carried out in Liverpool by Sadler and Green, who were the inventors of the process.

From the first Wedgwood set himself to produce nothing but the best quality of ware, and his reputation as an expert potter grew steadily. In 1765 he received his first order for Royalty. The order was for a tea-set " with a gold ground and raised flowers upon it in green," for Queen Charlotte, wife of George III, and she was so pleased with it and with subsequent orders that she allowed the Cream-Colour to be named " Queens Ware." Nine years later Wedgwood completed a further Royal order for the Cream-Colour, this being a dinner and dessert service for the Empress Catherine II of Russia. The service consisted of 952 pieces decorated with English scenes to a total number of 1,244; and the artists' work and the enamel painting alone cost more than £2,000.



Typical Wedgwood Placques. The bottom left-hand design, entitled " Blind Man's Buff," is by Flaxman.

In 1762, while on a journey to Liverpool to arrange for the printing of his ware by Sadler and Green, Wedgwood was laid up for a few days by an accident to his weak knee. The surgeon who attended him introduced him to Thomas Bentley, a Liverpool merchant who had travelled widely on the Continent and had a considerable knowledge of art, both ancient and modern. This meeting led to a lifelong friendship of remarkable closeness. Four years later Wedgwood proposed that Bentley should join him as a partner, and in 1769 this arrangement was carried out.



Vases in Jasper ware, showing the beautiful classical designs in which Wedgwood delighted.

Although the Burslem works were small, their continued prosperity enabled Wedgwood to accumulate a considerable amount of capital. In 1766 he bought for £3,000 an estate between Hanley and Newcastle and built upon it a house and a new factory, which he named Etruria after the ancient country in Central Italy. Wedgwood celebrated the opening of the new factory by " throwing " six vases while Bentley turned the wheel. The vases were painted with classical figures in red on a black body, in imitation of the old Etruscan ware, and two of them are still preserved in the Wedgwood Museum at Etruria.

Having achieved success in the making of " useful " ware, Wedgwood turned his attention to " ornamental " ware, commencing with what he called "black basalt " which was an improved form of a Staffordshire ware known as " Egyptian Black." This ware provides a typical example of the improvement in quality that Wedgwood brought about in every type of pottery to which he gave his attention. Starting from the basis of the crude " Egyptian Black," he produced a ware of a richer colour and of finer grain and smoother surface than any black previously made. He employed this " black basalt " for both " useful " and " ornamental " ware, and also used it as a ground for classical paintings with enamel colours that had a mat surface when fired, the effect being similar to that of the ancient Etruscan vases.

All Wedgwood's previous productions were surpassed, however, by the famous Jasper ware introduced in 1774. It is with this that the name of Wedgwood is most closely associated among the general public, and from its first appearance the ware has been highly valued by experts. Jasper was the result of a long series of experiments on a vast scale. Some idea of the labour involved may be gained from the fact that more than 10,000 trial pieces have been preserved, and these do not include any of the earlier trial pieces, which unfortunately were destroyed. It is interesting to know that Wedgwood himself valued this ware above all others that he ever produced. Jasper is a fine semi-porcelain body and it was made in all shades of blue and green, as well as in black and white.

In his determination to produce the finest possible quality of work, Wedgwood continually sought for good artists and modellers. Many of his designs, especially those for classical friezes and portrait medallions, were made by John Flaxman, who afterwards became so famous as a sculptor. At the time when Flaxman commenced work for Wedgwood, in 1775, he was a youth of 20, and it was the payment he received for this work that enabled him to live comfortably during the period in which he was perfecting his art.

Wedgwood's greatest triumph in Jasper ware was his reproduction of the famous " Portland " Vase. This vase was purchased by the Duke of Portland for £1,029, and on hearing that Wedgwood desired to copy it the Duke lent it to him in order that he might take a cast. The task of reproducing the features of the vase was extremely difficult, but it was one that appealed strongly to Wedgwood's artistic ambition. For four years he carried out experiment after experiment in order to obtain the correct colour, surface and texture, and in 1790 he produced his first copy, which met with the highest appreciation from all who examined it, including the famous artist Sir Joshua Reynolds.

In addition to his great work as a potter Wedgwood took a prominent part in securing better transport facilities in Staffordshire. At that time the roads were in a terrible state, and the potters found great difficulty in obtaining the materials for their work, and in despatching their completed wares to Birmingham, Liverpool and elsewhere for sale. In 1762 Wedgwood formed one of a group of master potters who petitioned Parliament for a new turnpike road through Burslem to join the London and Liverpool road. This petition met with small success, and three years later another turnpike road scheme to cost £2,000 was planned, and Wedgwood contributed £500 towards this. About that time Wedgwood heard of the proposal of James Brindley, engineer of the famous Bridgewater Canal, to construct a canal to connect the Rivers Trent and Mersey. The obvious advantages of such a waterway appealed strongly to Wedgwood, and he used his utmost efforts to help the scheme along, contributing £1,000 towards its cost. The work was commenced in 1766, Wedgwood cutting the first sod, and the canal, 93 miles in length, was completed in 1777.

In 1783 Wedgwood was elected a Fellow of the Royal Society, to which he had contributed papers dealing with a pyrometer for measuring high temperatures and with the

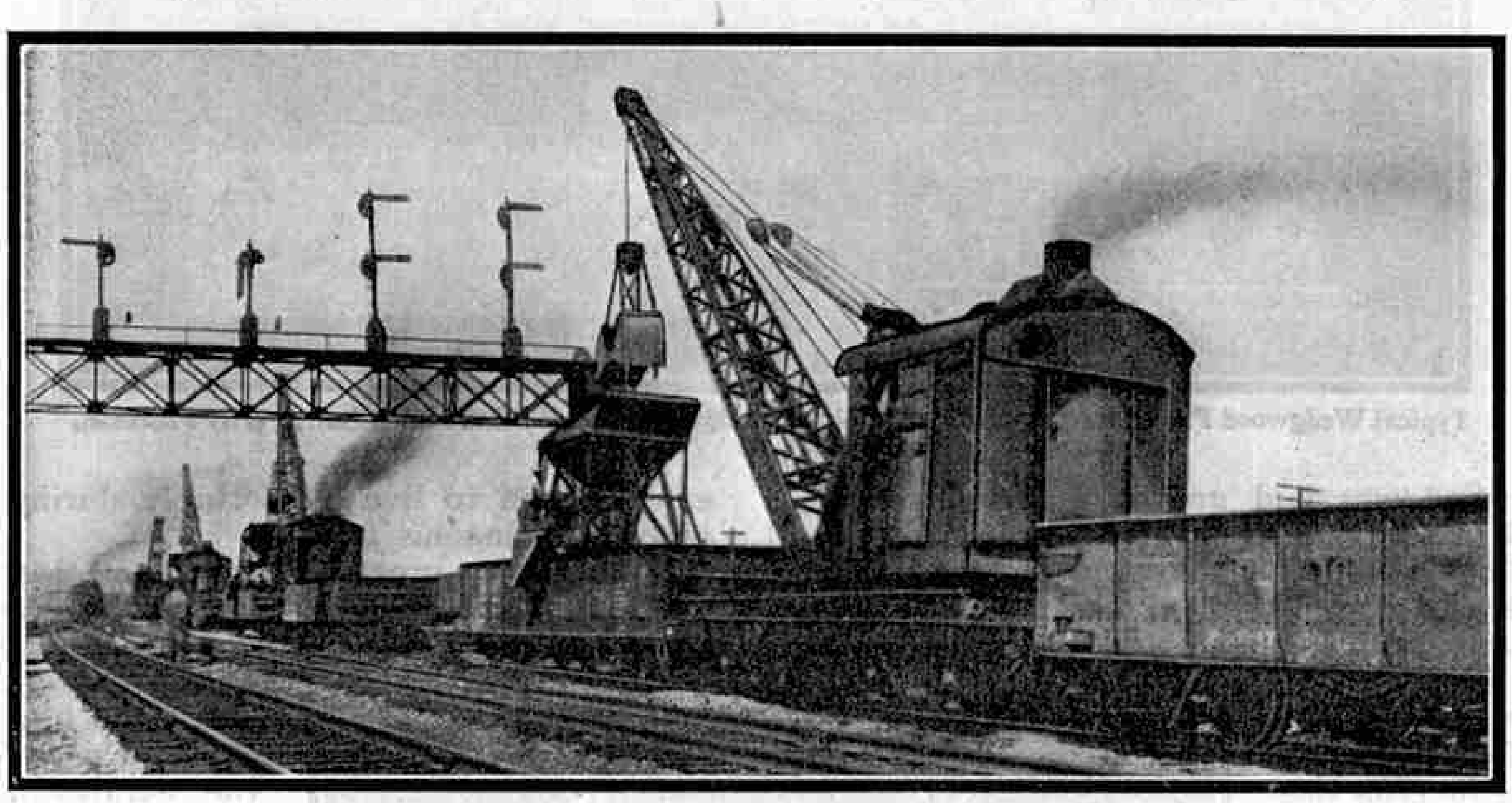
(*Continued on page 580*)

United States Permanent Way

Some Comparisons and Contrasts

By D. Arnold-Forster, Rear Admiral (Ret.)

THERE is a fairly widespread impression in this country that American railroad track, with its flanged spiked rails, is light and flimsy compared with the rigid-looking track, with the familiar bullhead rails and solid cast iron chairs, to be seen on any of our main lines. This idea is strengthened by the belief that derailments are more frequent in America than in this country. The fact is, however, that the main line track of the United States railways is heavier than ours, and the American method of laying is at least as rigid. Their track carries much heavier rolling stock than ours, yet very few accidents are directly due to failure of the track. It is true that the average speed of passenger traffic is higher here than in the United States, but many of their heavier passenger trains run at speeds as high as any of ours. The American railways also run fast freight trains of enormous weight, a practice that necessitates the provision and upkeep of an extremely solid and rigid form of permanent way.



Ballast screening on a United States railway : Multiple crane and grab unit.

A few comparisons in regard to these various points will be of interest. My information is based largely upon material kindly placed at my disposal by Mr. R. Carpmael, Chief Engineer of the Great Western Railway, as a result of his tour of inspection of United States railways; and to him also I am indebted for the photographic illustrations.

The weight of the "King George V" class of locomotive, with tender, is 136 tons, with axle load on the drivers of 22½ tons. Many locomotives running on the United States railways weigh 300 tons or more, with axle loads of from 29 to 32 tons. In this country the weight of a passenger train may run up to 600 tons or so; in the United States it may reach 1,200 tons. A goods train made up of 80 trucks with a gross weight of 1,600 tons is regarded here as a heavy load; but in certain districts of the United States they run coal trains a mile in length and weighing 12,000 tons. There is also a regular service of ordinary heavy freight trains run at speeds of from 45 to 60 miles an hour.

Ballast tamping with 12-unit compressed air machine.

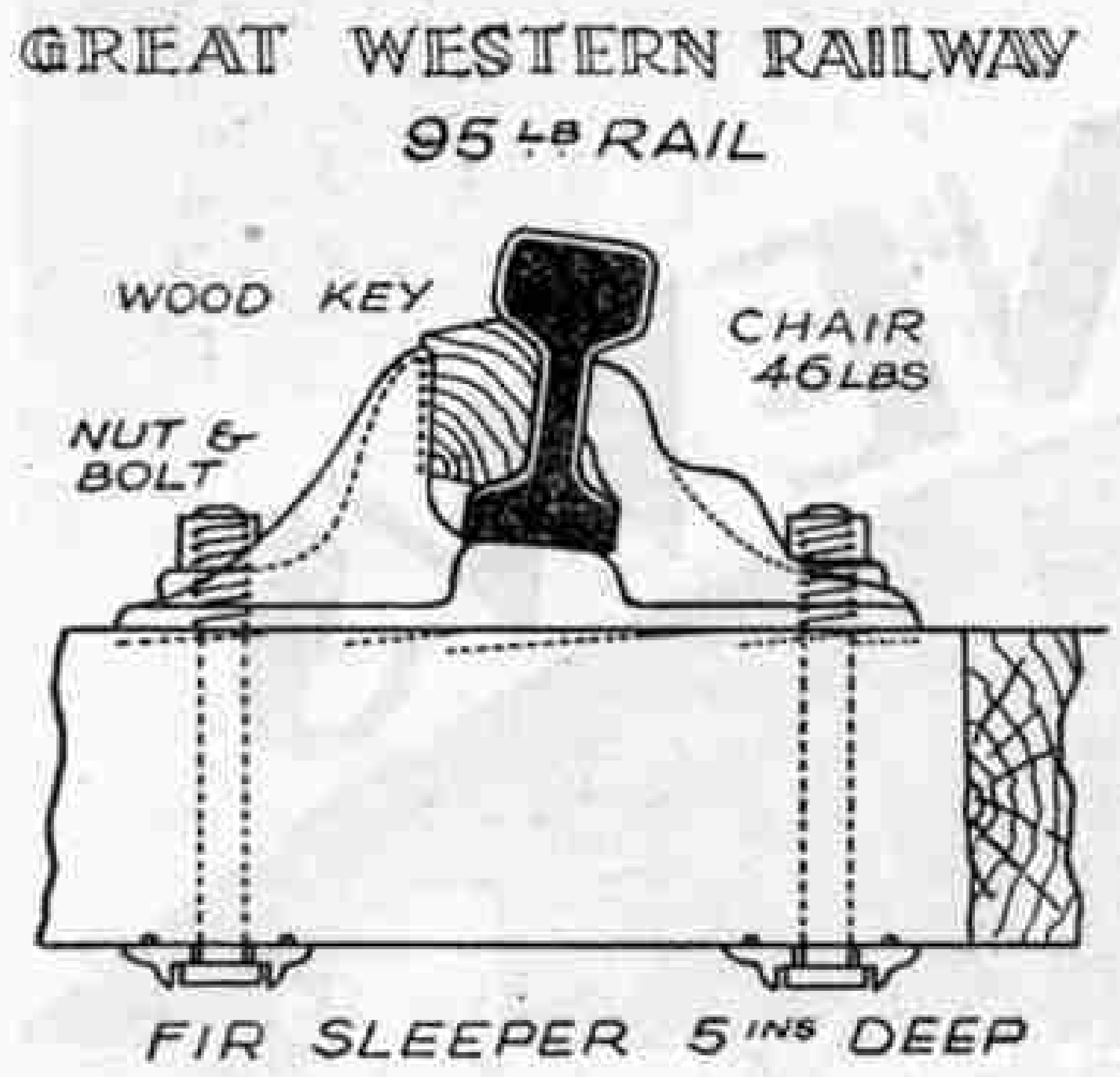
The gradual increase in the weight of rolling stock in the United States necessarily called for corresponding increase in the strength and rigidity of the permanent way, and now they use rails heavier than any to be seen in this country. Several of their main lines have adopted a 136-lb. rail, while on our main lines the 95-lb. rail is found adequate. The upper diagrams on the opposite page show in section the shape of these two types of rail, and the method of securing them to the sleepers.

It will be noticed that the flange of the American rail no longer rests directly on the sleeper, as it did in its earlier form, but is supported on a tie plate of quite considerable weight, both rail and tie plate being secured down to the sleeper by cut spikes. Any tendency to lateral movement on the sleeper is prevented by the serrations shown on the underside of the tie plates. The sleepers, which are always made of oak or some other hard wood, are rather thicker than our standard sleepers of soft Baltic fir; and they are spaced only 20 in. apart (centre to centre), as compared with the 30-in. spacing to which we are accustomed.

Besides the difference in the shape of the rail and in the method of securing it, another noticeable difference between American practice and our own is in the relative position of the rail joints. The joints on the American rails are not placed abreast of one another, but a joint in one rail is placed so as to come exactly midway between two joints of the other. The object of this arrangement is to secure the smoothest possible running; the chief objection to it is that it tends to produce rolling on tracks that are not exceptionally rigid.

The lower diagram opposite shows the method of ballasting on typical British and United States railways. It will be noticed that whereas we use two thin layers of ballast—top and bottom of different sized material—the Americans use a single thick layer of crushed stone. The cinder foundation shown is used in addition where the nature of the soil requires it. The American arrangement facilitates extensive ballast operations by mechanical means.

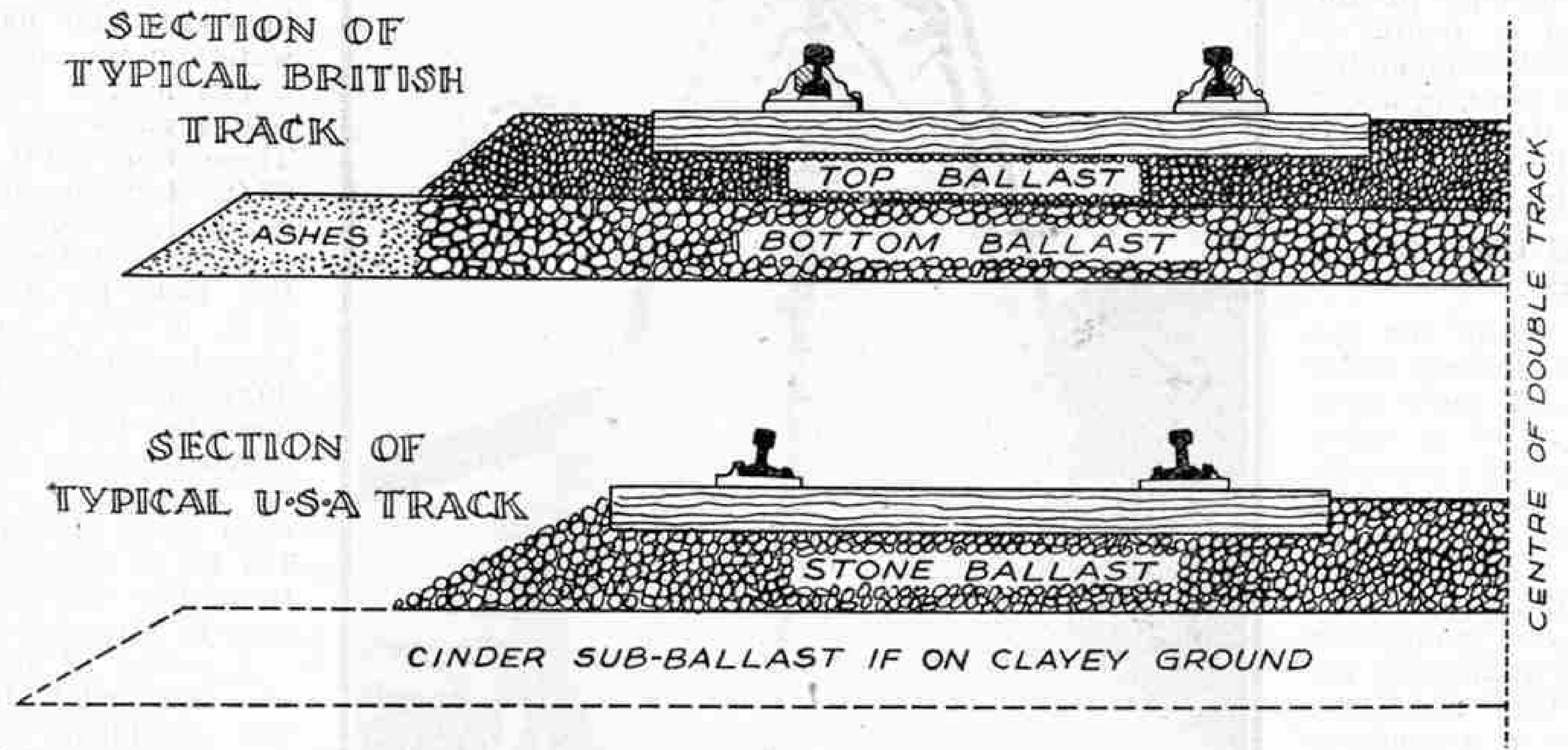
Cleaning of ballast has to be undertaken on any well-kept road if soil works into it and interferes with the drainage. But in America more common causes of dirty ballast are the excessive discharge on the track of cinders from their soft-coal burning locomotives, and leakage of small coal from hopper trucks. It would take too long and necessitate the employment of too many men to pick over ballast by hand on the long lengths of track on the United States railways, and two quicker methods are employed. One method consists of the use of a queer-looking petrol-driven machine called a "Mole," which burrows along between the two tracks, digging up the ballast in front of it. As it moves along between the tracks it pours clean ballast out behind, the dirt being separated out as it passes through the body of the machine.



The other mechanical method of ballast cleaning is by the use of crane and grab. The working unit consists of a steam or petrol-driven crane with a truck into which the ballast clawed up by the grab is dropped and screened. For extensive screening operations a train of several such units is made up and worked along the line in "fleets." Dry earth can be screened out with the coal and cinders, but if patches choked with clay are encountered, the grabs full of dirty ballast are swung out and dropped over the bank.

In traversing great tracts of country the American railroads sometimes pass through deep cuttings that are dangerous owing to their liability to heavy slips of earth and rocks from the sloping faces. Some of these are far from any habitation, and the need for watching them presents a difficulty. This is got over by erecting lengths of special wire fencing at the side of the line, so arranged that if a big slip occurs the disturbance of the wires breaks an electric circuit and so puts at the "stop" position warning signals at each end of the cutting.

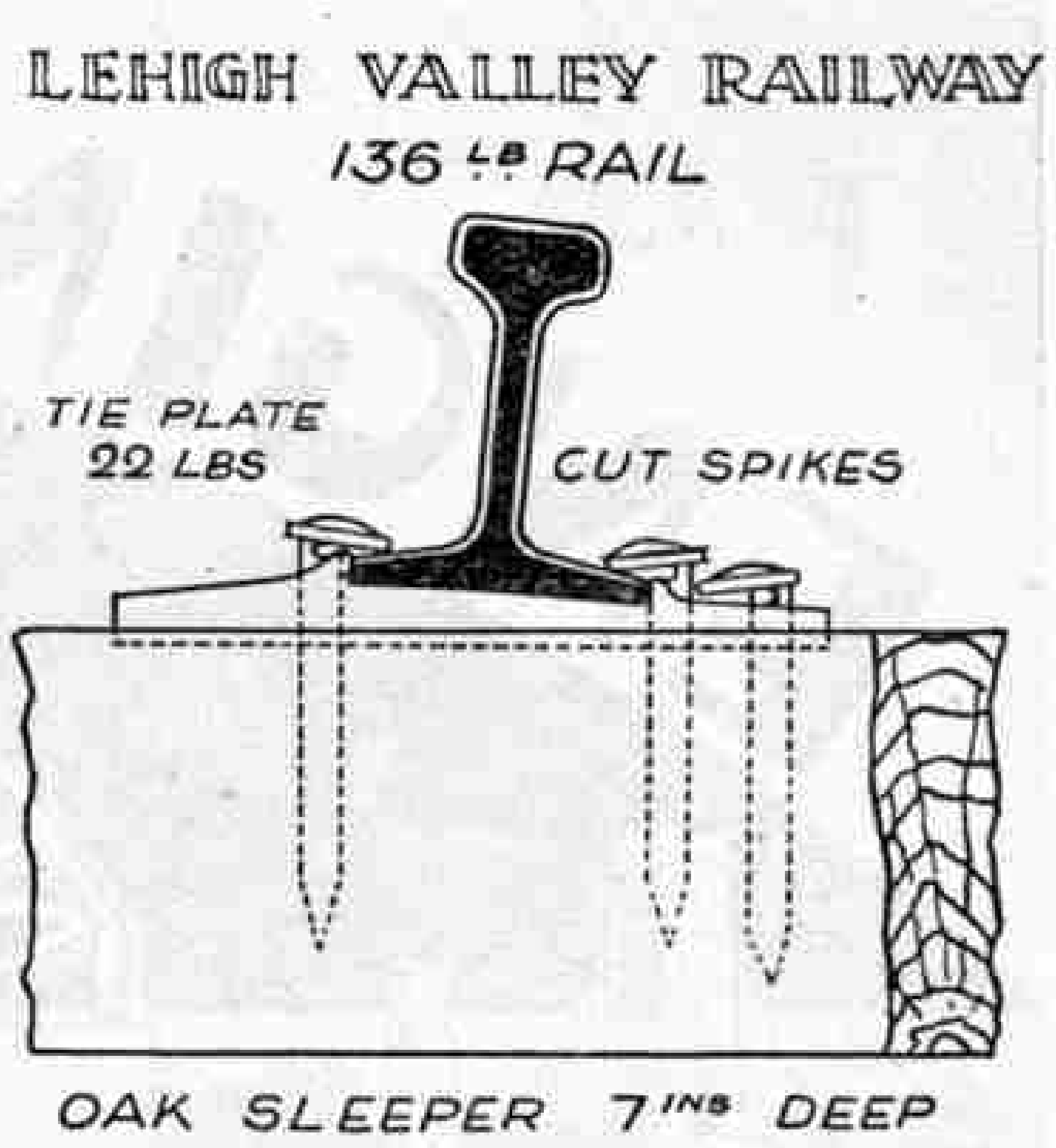
Many roads pass over long, steep gradients, and often the nature of the country necessitates sharp curves. With regard to curves, it has been found that a touch of oil on the inner face of the upper rail not only eases the load on the engine, but also saves wear both on the rail and on the wheel flanges of the rolling stock. In places where watchmen are stationed this oiling is done by hand. In other places a power worked trolley is employed, carrying an oil container that feeds oil slowly to a fibre disc in contact with the rubbing face of the rail. In some cases direct oiling is done through jets fitted on the locomotive. In certain districts an ingenious automatic arrangement is fitted that makes each passing train do the oiling for itself. This device consists of an oil-box, 10 ft. to 12 ft. in length, attached to the sleepers and fitted with discs in contact with the rails. These discs are revolved by gearing actuated by the pressure of the wheels of the passing trains. A little oil goes a long way, and spreads itself for several miles. Whichever method of oiling is used, care is taken that no oil gets on the upper surface of the rail, where it might cause "slipping."


SECTION OF TYPICAL BRITISH TRACK
TOP BALLAST
ASHES
BOTTOM BALLAST
SECTION OF TYPICAL U·S·A TRACK
STONE BALLAST
CINDER SUB-BALLAST IF ON CLAYEY GROUND
CENTRE OF DOUBLE TRACK

When a long heavy train ascends a steep gradient, it is found that the slight roughness of the rail surface, caused by the application of sand by the locomotive, adds appreciably to the tractive effort required to pull the train. On some lines locomotives are fitted with a steam jet in rear of the trailing driving wheel. This jet is used when sanding to clean the rail for the train behind, and it is claimed that the device enables five more wagons to be added to each heavy freight train.

It is well known that in the United States great use is made of machinery of all kinds for the saving of labour, and nowhere is this more noticeable than on the railways. The curious machine called the "Mole" has already been referred to. There is another elaborate machine called the "Jordan Spreader," which is a complicated sort of plough fitted to run on the track. With various adjustments it can be used to level off shoulders of ballast, to clean out the ditches on either side of the line, and to remove accumulations of vegetation from cuttings. In winter it becomes a very useful snow plough.

For transporting material for earthwork, embankments, etc., there are "dump cars" with a capacity of 30 to 40 tons, with bodies that can be side-tipped by compressed air. These are made up into trains and run where required at 60 miles an hour.



Tools called "ballast tampers," worked by compressed air, are in common use. Made up in sets of four, eight, and twelve, they are employed by road gangs for tightly repacking the ballast under the sleepers.

Whatever else may be said for or against the spike rail system of track, it certainly lends itself to rapid laying, and maintenance staffs on the United States railways pride themselves on the rapidity of their rail-laying and rail-shifting operations. Any operations of this nature on the line are facilitated by liberal use of the telephone. All gangs carry portable field telephones that can be connected at any point to the control wires. Communication is thus set up with the train despatchers, who can put single working into force in any section without delay. If the section is a long one and the operation on a large scale, temporary crossover points are laid near the scene of work so as to reduce delay to traffic.

When a section of line is to be relaid, a works train is brought to the spot. Included in the train are one or more rail-carrying trucks, and several steam travelling cranes, some of which run on the track itself, while others are carried on lines laid in the cars of the works train. Working in pairs, two steam cranes, one at each end of the rail truck, lift out the heavy rails and string them along the line. The subsequent shifting about and placing of the rails for laying is done by means of light, self-contained cranes, most of which are petrol driven. In suburban areas, where the heavy traffic would be seriously delayed by the presence on the line of the works train, the actual laying of the rails is generally done by hand labour.

A simple but handy contrivance much used by road gangs is a small two-wheeled trolley running on one rail only. This can be propelled by one man, and is useful for carrying about odds and ends such as bags of bolts, etc. Petrol-driven gang trolleys are also freely employed for moving about men and material. In all rail-laying and rail-shifting work great use is made of portable petrol-driven machines for boring holes in rails and sleepers, tightening fishbolt nuts, etc.

Rail changing and other track work is carried out piecemeal all the year round, operations being fully organised so as to cause the least possible delay to traffic. Some quite extensive rail-shifting is actually carried out "between trains." A quotation from a paper by Mr. G. L. Moore (late Engineer of Maintenance way, Lehigh Valley) gives some idea of what can be done:—"One day in January 1913, new 110 lb. rail was laid in No. 1 track from Richards to Bethlehem, Pa., a distance of eight miles. The actual laying of the rail was completed early in the afternoon, and before the end of the day the track was thrown open to traffic, fully bolted, spiked and bonded and all automatic signals working."

Another example of quick rail-shifting on a smaller scale, in the Philadelphia suburban area, is the changing of 312 yards of single rail by 70 men in 10 minutes! This time was the actual interval between the passage of trains over the section.

Enough has been said to give some idea of the permanent way on the United States railways, and the methods employed for its maintenance. General conditions and railway requirements in the two countries are so very dissimilar that it is not surprising that their practice in these matters has developed on different lines.

Remarkable Well at Slough

Recently an artesian well was bored at Slough by C. Isler & Co. Ltd., for Horlick's Malted Milk Co. Ltd. The scenes that occurred when water was reached resembled on a minor scale those that attend the gushing of a giant oil well. The water spurted up in a solid column 12 in. in diameter and reached a height of 30 ft. This is not as high as the column of oil that emerges from a typical gusher, but it is remarkable for a well sunk to the water-bearing strata of the London basin.

The well passed through the chalk and gault and encountered water of excellent quality in the Lower Greensand at a depth of 1,037 ft. 6 in. The overflow amounted to 250,000 gallons per hour, or about six million gallons daily. This is believed to be the largest overflow recorded for a well in this country.

New Road Tunnel Under the Thames

Plans have been made for the construction of a new tunnel under the River Thames and these have received the approval of a Select Committee of the House of Commons. The tunnel is to be bored between Dartford and Purfleet, and will be at a depth of 56 ft. 9 in. below the river bed. This is sufficient to allow the deepening of the navigation channel of the river if shipping developments make this necessary.

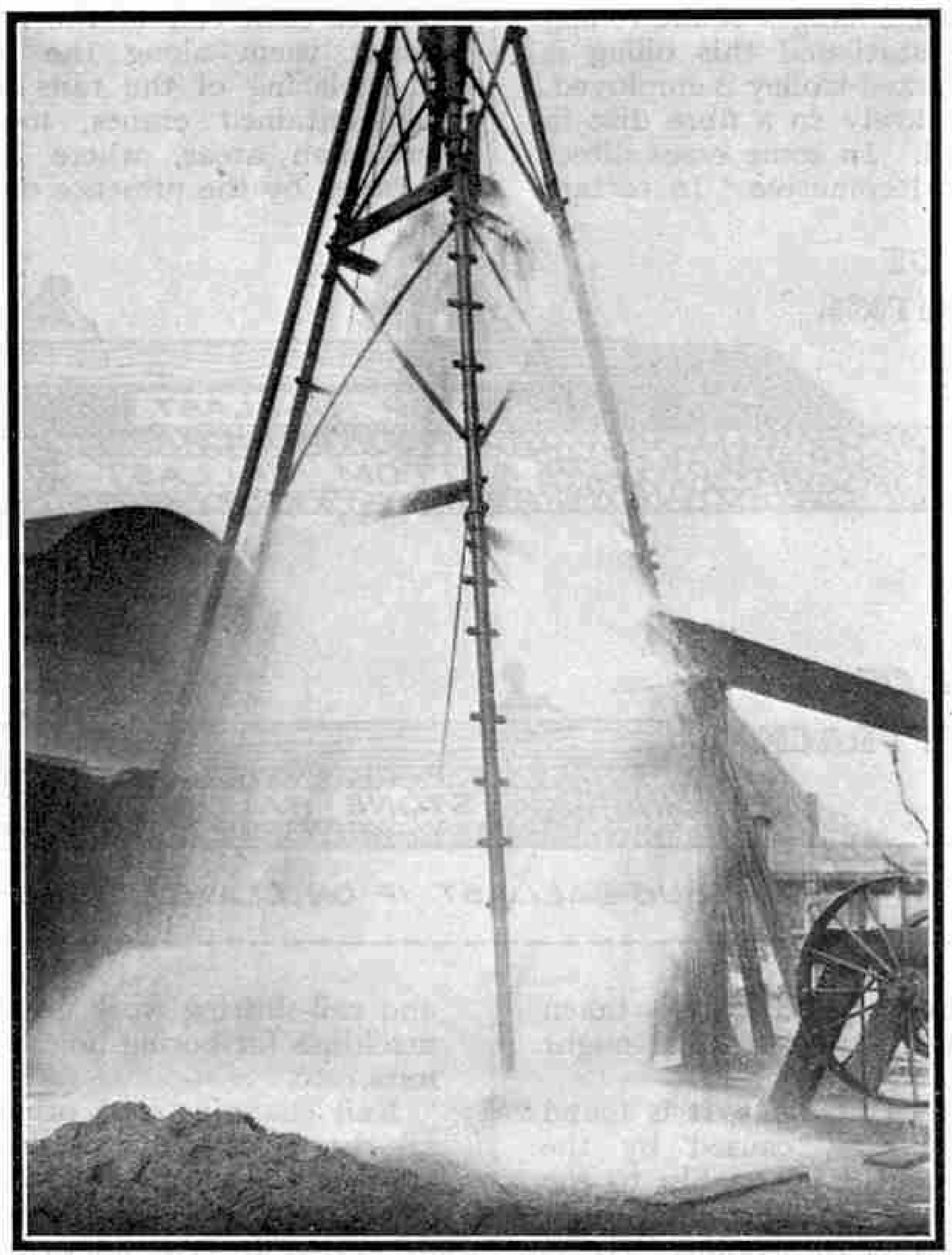
The tunnel will have a roadway 19 ft. in width and will be of sufficient height to allow double-decked omnibuses to make use of it. The estimated total cost of its construction is £3,000,000. Of this sum £2,250,000 is to be found by the Ministry of Transport, the remainder being contributed by the Kent and Essex County Councils and various local authorities. A certain amount of the cost will be recovered by means of tolls.

Ship as Power Station

An American vessel, the "*Jacona,*" has been sold by the United States Shipping Board to be converted into a floating power station that will generate electricity for a number of cities along the coasts of the States of Maine and New Hampshire.

During the summer months, the hydro-electric power stations that normally provide current for these cities work under great difficulties, for periods of prolonged drought often are experienced and they are forced to close down, leaving the cities without light and power.

In order to make the vessel suitable for generating purposes, the "*Jacona*" is to be altered extensively. The whole of the existing propelling and deck machinery will be removed and she will then be fitted with two 10,000 k.w. turbo-generators, which will be supplied with steam by four large high-pressure water-tube boilers.



Courtesy] [*C. Isler & Co. Ltd.*

A column of water 30 ft. in height that escaped from an artesian well recently bored at Slough. The overflow of 250,000 gallons per hour is believed to be the largest ever obtained from a well in this country.

The total cost of the work to be carried out on the vessel is estimated at £250,000.

This is not the first occasion on which current has been supplied from vessels afloat. On one occasion last year the supply at Tacoma, Washington, failed, and the U.S. Navy aircraft carrier "*Lexington*" provided the city with current from her main generating sets.

* * * *

A motor omnibus with three decks is now in service at Hamburg. Vehicles of this nature are expected to prove popular in busy towns.

World's Largest Lock Open for Traffic

The world's largest lock, which is at Ymuiden at the entrance to the canal joining the North Sea and Amsterdam, is now open for traffic. As noted on page 687 of the "*M.M.*" for September, 1929, the lock is capable of taking the largest vessels afloat, being 1,312 ft. in length, 164 ft. in width, and 49 ft. in depth over the sills. It is 312 ft. longer than the locks of the Panama Canal and, although a few feet shorter than the locks on the United States side of the Sault Ste. Marie falls between Lakes Superior and Huron, it is much larger than these, for the "Soo" locks are only 80 ft. in width and have 24 ft. 5 in. of water on the sills.

The lock is equipped with three rolling gates each 23 ft. 6 in. thick. These are 175 ft. 6 in. in length, 67 ft. 4 in. in height, and weigh nearly 1,200 tons.

At present the canal leading from the lock to Amsterdam is only 41 ft. in depth, but shortly it is to be enlarged to a uniform depth of 49 ft. Crossing the canal at the Ymuiden lock are two huge swing railway bridges completely operated by electricity. On being swung open these give a clear passageway 164 ft. in width and it is claimed that they are the largest of their type in Europe.

A period of more than ten years was occupied in the construction of the enormous lock at Ymuiden, and its cost is said to have been about £1,500,000.

Two Hundred Sparks a Second

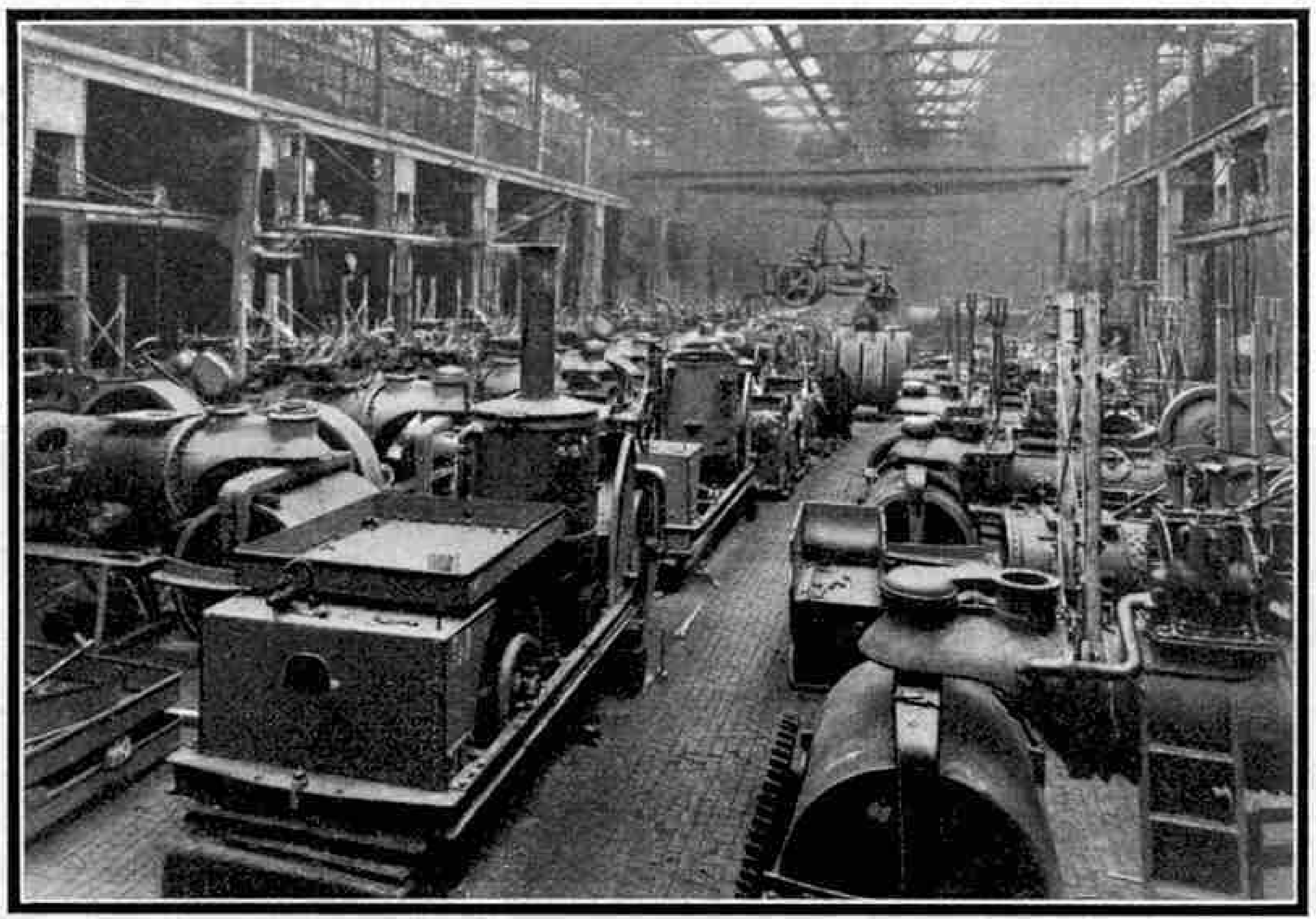
While a modern 8-cylinder motor car travelling at 60 m.p.h. is covering a distance of one mile, no fewer than 12,080 sparks are produced. The pistons travel at a rate of four miles a minute, and each changes its direction 6,040 times in an hour. The inlet valves are no less active than the pistons, for when actuated by its cam each one rises and falls in its seat in one seventy-fifth of a second. The petrol vapour enters the cylinders at the astonishing speed of 135 m.p.h. Naturally cooling an engine working at this rate is a serious problem, and for efficient working more than 80 gallons of water are pumped through the cooling system in one minute. During the same period a point on the upper edge of the blade of the cooling fan travels about three miles.

Overhead Cables in Baltic Sea

An interesting scheme for the transmission to Germany of electric power developed in Norway is receiving considerable attention. There are many waterfalls in the rapid mountain streams of Norway, and consequently hydro-electric power is comparatively cheap. In fact it is said that the difference between its cost, and that of electric power generated in other ways in Germany, is sufficient to warrant the expense of the construction of transmission cables over the long distance between the two countries, and plans for supplying to Germany current at 380,000 volts have been formed.

When this scheme was first considered it was proposed to lay submarine cables across the Oere Sound and the Baltic Sea. It is now proposed that, instead of these, overhead cables should be employed. The water to be crossed is shallow and it is expected that it will be easy to find places where foundations for the masts may be laid at the bottom of the sea. In Germany tall masts for similar purposes have been erected at distances apart of more than 900 yards, and in order to carry the cables across the Baltic Sea it is expected that about 25 giant poles, each about 600 ft. in height, would be required.

At first only 500,000 k.w. would be transmitted along the lines, but eventually this would be increased to 1,000,000 k.w. Six cables would be used for the transmission of power, and when the full scheme is put into operation several additional waterfalls in Norway will have to be harnessed.

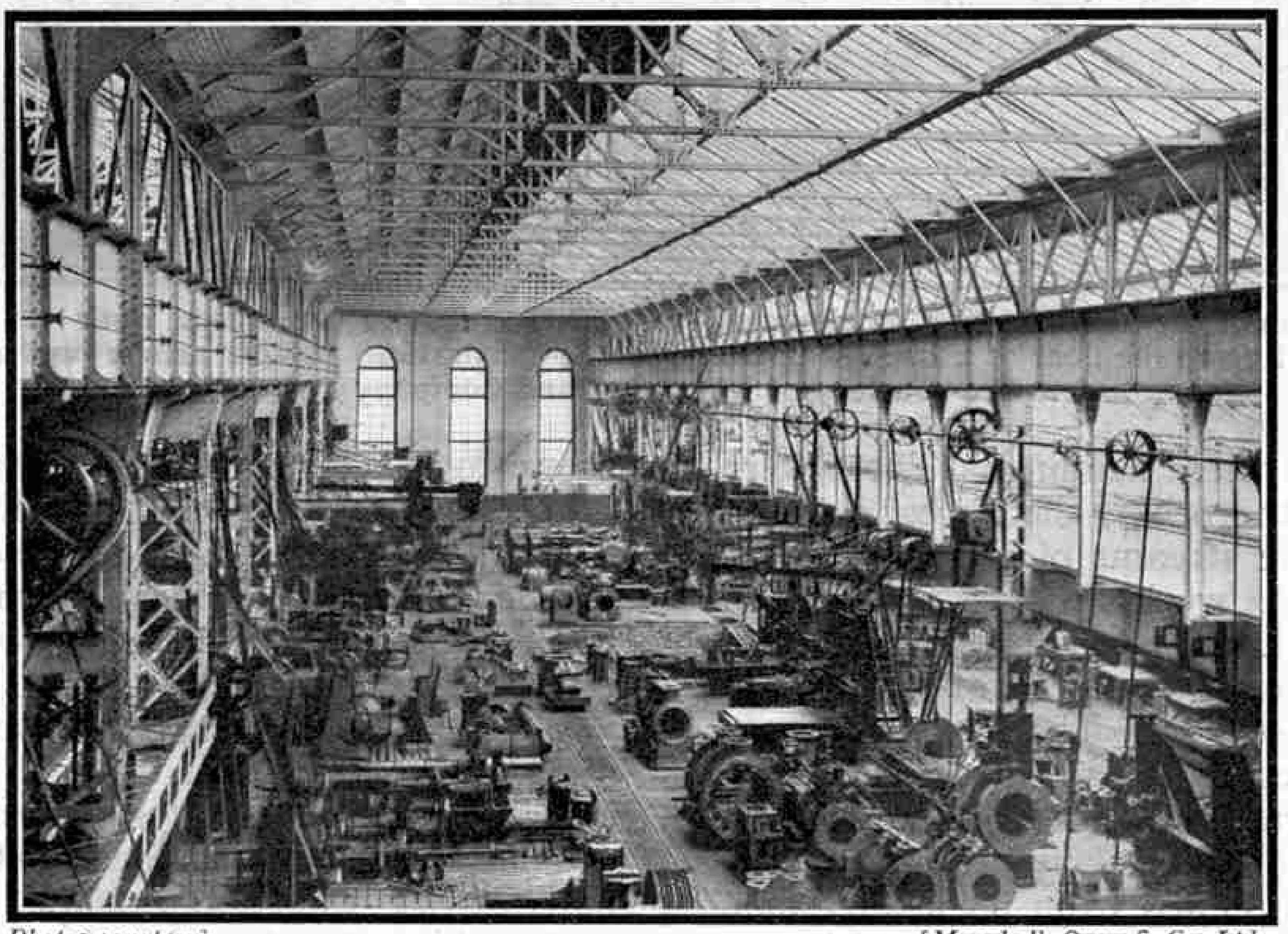


The shop in which steam road rollers are erected in the Britannia Works, Gainsborough. The engines of these rollers employ piston valves, which give a higher mechanical efficiency than slide valves, and a radial valve gear instead of link motion.

New Steel Bridge at Folkestone Harbour

A short time ago the wooden bridge that had spanned the Old Harbour Channel at Folkestone for 37 years was demolished. This was completed in 1893 and until recently was quite strong enough to bear all traffic passing over it. With the advent of heavier locomotives and rolling stock it was found that the old structure could not carry the trains with safety, and it has now been replaced by a modern steel swing bridge.

The new bridge weighs 275 tons. The weight of the swinging section alone is 260 tons, which is 110 tons more than that of the entire old bridge. It is supported on a central pier that is square in section, each side being 32 ft. in length. The moving portion runs on roller bearings. It is about 132 ft. in overall length, and when opened leaves two channels into the Old Harbour, each of these being 50 ft. in width.



Photos courtesy] [Marshall, Sons & Co. Ltd.

One of the engineering departments in the Britannia Works of Marshall, Sons & Co. Ltd., Gainsborough. The transport of heavy machinery and castings is carried on by means of the narrow gauge lines that may be seen in our photograph.

The S.S. "*Empress of Japan*"

The Canadian Pacific liner S.S. "*Empress of Japan*," which was launched in December, 1929, has now successfully completed her maiden voyage. This vessel has been constructed by the Fairfield Shipbuilding and Engineering Co. Ltd., of Glasgow, and will be the largest mail and passenger ship operating in the Trans-Pacific Service. She is intended for regular service between Vancouver and Yokohama.

The "*Empress of Japan*" is 666 ft. in overall length, and has a width at the promenade deck of 87 ft. 9 in. and a depth (moulded) to bridge deck of 56 ft. 9 in. The total height from the top of the wheelhouse to the keel, is 107 ft. The gross tonnage of the vessel is 26,000, and her designed speed is 21 knots. She has cabin accommodation for 400 first-class passengers, 164 second-class, and 100 third-class, while 548 Asiatic passengers may be carried in the steerage. The crew numbers 559, bringing the total carrying capacity of the ship up to 1,771.

Twin Tunnels Four Miles in Length

The provision of adequate means of communication between Manhattan, the island on which New York is built, and Brooklyn, Jersey City, and other places on the mainland or on Long Island is a problem that appears to be almost insolvable. Giant bridges and enormous under-river tunnels have been built for this purpose, the latest feat in this respect being the completion of the wonderful Holland Tunnel described in the issues of the "*M.M.*" for February and March last. The opening of the twin tubes of this tunnel relieved congestion at the Hudson River crossing, and attention has now been turned to the other side of the city. There the Brooklyn, Manhattan and Williamsburg suspension bridges have become incapable of dealing expeditiously with the enormous stream of traffic to and from Brooklyn, and it is now proposed to construct yet another tunnel in order to supplement them.

The proposed tunnel will resemble the Hudson Tunnel in that it will consist of two tubes, but each of these will be four miles in length, and thus they will be nearly a mile longer than those under the Hudson River.

The new structure will be the largest of its kind in the world. Each of its tubes will be capable of taking three streams of traffic that will include vehicles of all classes. Three ventilating shafts will be provided in order to ensure that the air underground is pure. One of these will be erected at each end of the tunnel, and the third will reach the surface at Governor's Island, where two elevators also will be provided. These will be 32 ft. in length, and will be capable of carrying heavily laden lorries.

Scotland's Largest Reservoir

A short time ago Scotland's largest reservoir was opened after having been under construction for about 15 years. It is situated at Camps, in the Upper Ward of Lanarkshire. In making the reservoir it was necessary to build an embankment across the Camps Valley. This is 300 yards in length and in places is 90 ft. in height. The storage capacity of the reservoir is about 2,100,000,000 gallons of water.

Steel Chain for Dome of St. Pauls

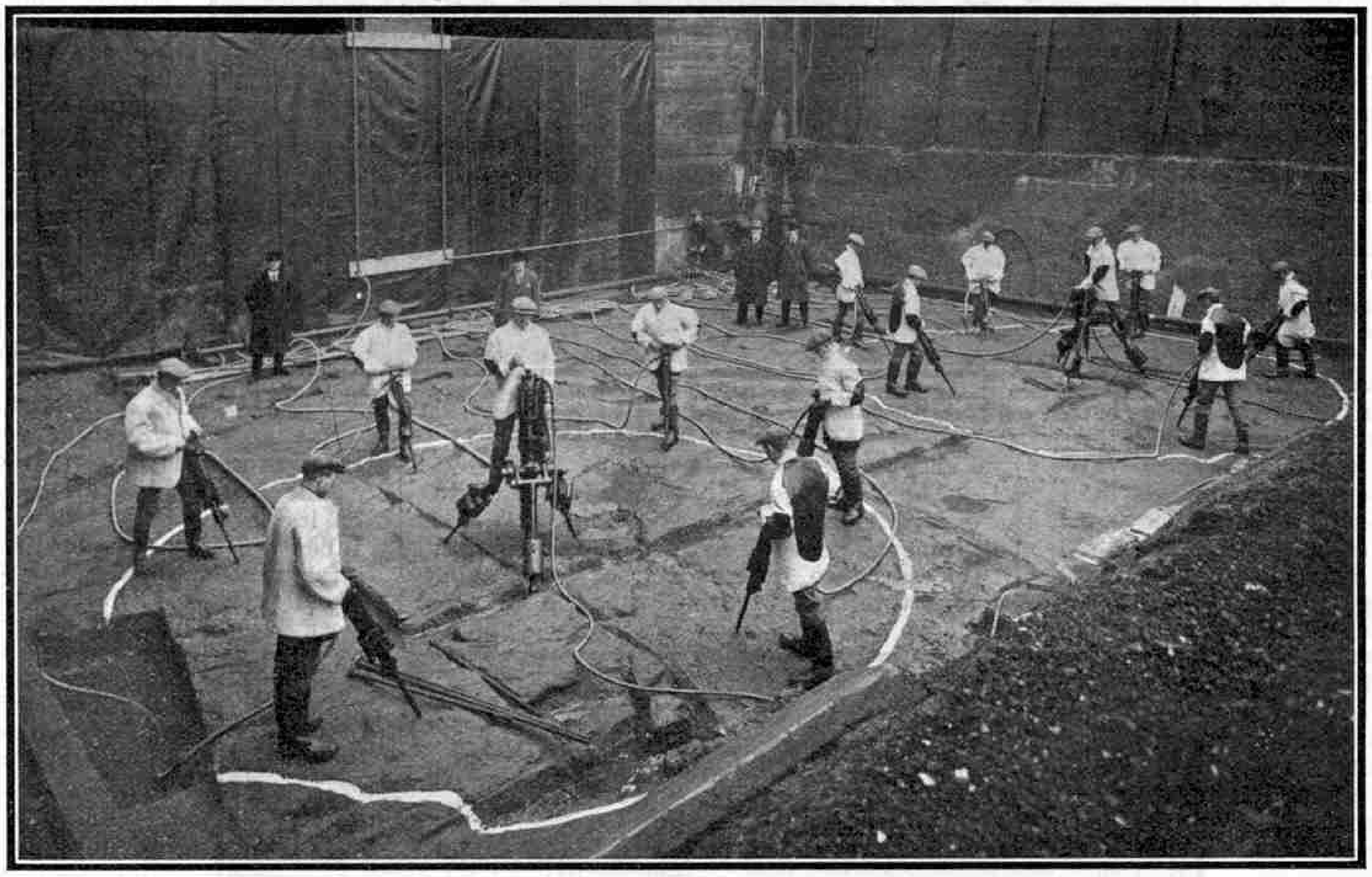
Work has been commenced at Sheffield on the second steel chain for the dome of St. Pauls. This is intended to check the expansion of the piers. The completed chain will weigh 40 tons, and will consist of 32 links, each 16 ft. 3 in. in length.

Early Days in the New Mersey Tunnel

How the Job was Tackled

By An Engineer

UNDERNEATH the Mersey estuary there is approaching completion a great engineering feat that will terminate ultimately in the opening of a colossal road tunnel, and the realisation of one of the most ambitious schemes of modern times. From the small part I played in the early work in connection with this tunnel, I gained a most interesting insight into the phase of civil engineering involved, and I hope to give readers of the "*M.M.*" some idea of the manner in which the job was tackled.



The inauguration of the new Mersey Tunnel operations. Drills ready to commence work on the shafts, which were sunk from the floor of a disused dock. For the illustrations to this article we are indebted to the courtesy of Ingersoll-Rand Company Ltd.

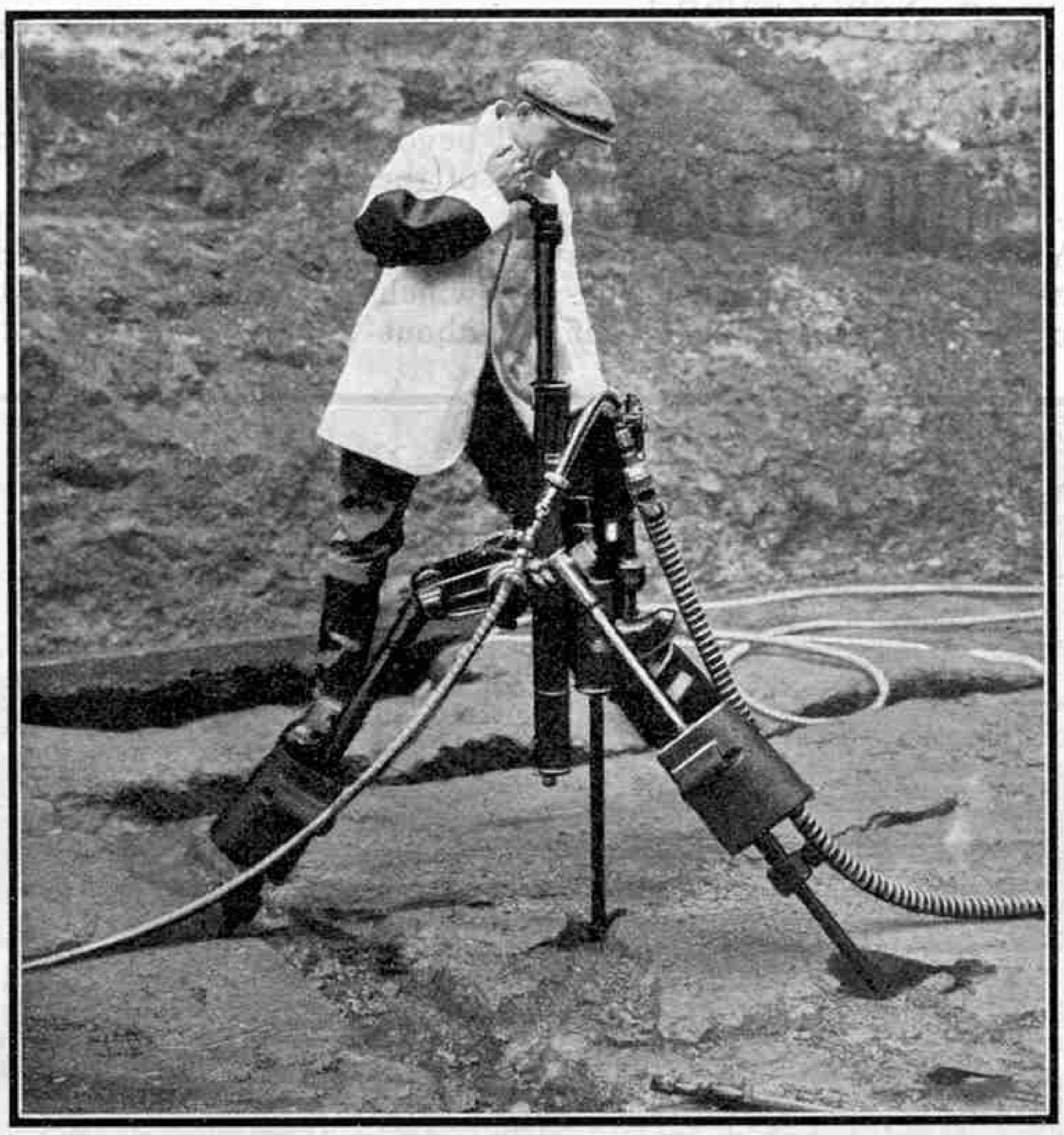
Passing over the sinking of the two huge shafts, each over 200 ft. in depth, from which the tunnel headings were driven, it will be an interesting start to gain an impression of the boring of these headings. There were three of them, one above the other, the lowest being a "drain" to carry away the streams of salt water that were always filtering into the workings. As for the two upper headings, imagine a London "Tube" station and you will have an idea of their diameter; for this is only a little less than that of the station. These two headings, thrown together, form the enormous tunnel itself, a two-level structure, with a separate entrance to each roadway.

One's working kit in the tunnel consisted of a heavy flannel "sinker's" suit—so called from its use by men employed in sinking pit shafts and the like—and heavy rubber thigh boots, oilskins and souwester. Flannel is used because, when clad in it, one can get wet through without risk of a chill. The headings were driven in sections, each carefully tested before excavation; and in connection with this testing we come to the important operation of trial-boring. Briefly this consists of drilling a long horizontal hole, 80 ft. to 100 ft. or thereabouts, into the rock about to be cut away, in order to enable the engineers in charge to "try-out" the ground ahead. The most serious trouble to be feared is that water might be released in large quantities during the blasting of the rock; and it is by putting in one, two, or more trial holes that those responsible are able to know all the time exactly what they are likely to meet as the heading extends. Without this precautionary measure the next explosive "shot" might let loose the full force of some chance underground stream, with appalling consequence to the men at work.

The machinery for the trial holes—assuming that two are to be bored—consists of two pneumatic drills of special type; two column-bars to carry them; boring rods, conveniently in 2½ ft. lengths that screw together; and a selection of boring bits. These bits screw on to the rods, and it is surprising how many of them are needed and how soon they become blunted by the red sandstone through which they cut. Rods and bits are made hollow to enable water to be fed constantly to the cutting surface. This is done for two reasons—first, to wash out the rock dust and prevent clogging, and second, to help the bit to cut. In order to give enough clearance the hole is started with a large bit.

The column-bars are heavy steel pillars with serrated ends of flat, mushroom shape; one end is extendable, jack fashion, by thread and ratchet. It is to these bars that the boring machines are clamped, and they are screwed tightly into position from floor to ceiling, so to speak. Timber is placed above and below them to give an even unyielding surface, and they are forced into as rigid a stand as possible since they have to resist very heavy vibration from the machines they carry. When the column-bars are satisfactorily fixed and the boring machines are firmly in place, we are ready for the first boring rod, the bit, and the water swivel to be coupled.

The boring machines themselves are little more than a framework carrying the rod mounting, water swivel and small rotary engine to drive the gear. These three are all in one, and slide backward and forward on the frame. To and fro movement is controlled by a handle and threaded rod, one end of which, with the handle, turns in a bearing on the framework, while the other end winds the engine and attachments into varying positions. As the "face," as the end of the heading is called, is several feet away, an appropriate number of rods is screwed together, ending with the large bit used to begin the hole. The rod line so formed is wound up to the start, and when we have coupled up the armoured compressed air hose to the engine we are all ready to commence work. Compressed air drives everything in the tunnel except the electric trucks that pull the loaded skips; and we tap the pipeline clipped to the wall for this safe, clean power. Turning on the water, we open the valve on the engine and commence slowly to wind the spinning rod line forward. The din from the two machines, in the confined echoing space, is terrific. It is the same kind of noise as that produced by the more familiar pneumatic drill that so often shatters the peace of the streets; but it is strange how soon one gets used to it, to the point of forgetting it altogether until one tries to make a remark to a fellow workman. Then, by yelling at the top of one's voice, with hands funnelled against his ear, it is just possible to make him understand!



A close-up view of one of the heavier type of compressed air drilling machines used in the new Mersey Tunnel.

If all goes well, the operator on the handle winds the bit steadily forward until the thread on the frame comes to an end. A hoarse shout as the engine stops, and we jump forward and join someone else in unscrewing the rods. A hearty heave with two Stillson wrenches and the joint gives, and the swivel is freed. The man on the handle winds it back and we insert another rod and screw it half a turn. Like a machine gun the engine starts again, and the rod tightens up and moves forward. Very soon we break the joint again, this time to "pull out," and replace the large bit with a smaller one. Muscular man-power draws out the rods, unscrews the bit, screws on the other one, and back go the rods into the hole again. So it goes on; rod after rod making the disappearing line longer and longer. Periodically we pull out to change a blunt bit for a sharp one, and that is an awkward job, especially for us if we get the end to look after and guide up the dim tunnel. Rhythmic heaves bring out yards and yards of rods, and we stagger away into the far distance, stumbling over the track of the electric "train," falling into puddles that are deeper then they look, and all the time keeping the end of the rod line from contact with ground or rock that would block the waterway. Seconds pass while the bit is changed, and eventually a distant hail echoes weirdly through the gloom, and we guide our end on its return journey. This, we are glad to find, is rather easier.

The hole is at last finished; it has probably taken us, with its fellow, the whole of a 12-hour day to complete. This assumes satisfactory straightforward progress, but troubles can arise and in plenty. As we watch the spinning rods we may see a sudden slow-up and hear a protest from the engine. Frantic haste must be made to "man" a Stillson wrench; the bit is binding badly and must be freed or the rods may break. We help the rods round and, if we are lucky, the engine picks up again; the bit is free. On the other hand, man-power may fail to help the engine, and we are faced with a jammed line that probably will take hours to release.

Let us suppose that luck has been with us and that the holes have been formed without hitch. A few feet of piping are jammed into them as a mark and protection, and then, dismantling the plant, we leave things ready for various tests to be made. The next operation, if the engineers are satisfied, lies with the blasting gang. They bring cartridges of gelignite with fuses attached, handling them with all the respect they need! The fuses, arranged to touch off the charges one after the other so that they can be counted, are lit in correct order, and the party retire to a safe distance to wait until all have gone off. The noise is considerable and somewhat alarming. If we happen to be near we either get into a recess cut in the wall, if one is handy, or flatten ourselves against the streaming sandstone, as much as possible out of the way of the volleying air currents set up. At each reverberating roar the whole solid heading quivers appreciably, and we probably start nervously as small flakes of stone are dislodged. There is little danger, however, if one takes care to keep at a respectful distance from the face. Even the fear that sometimes overtakes one that the heading may collapse is really without foundation; tests of its stability are too careful and frequent.

Turning from the preliminary work described to the actual business of driving the headings, it is difficult to realise the enormous amount of labour involved in this task. Every single chunk of rock cut out with pick and shovel after the loosening by blasting charges has to be loaded on a skip, one of a line attached to a small electric truck. The skips are hauled by this truck up to the main shaft and then man-handled on to one of the cages, wound up to the top of the gear at the shaft-head, pushed off along a short platform, and there

(Continued on page 566)

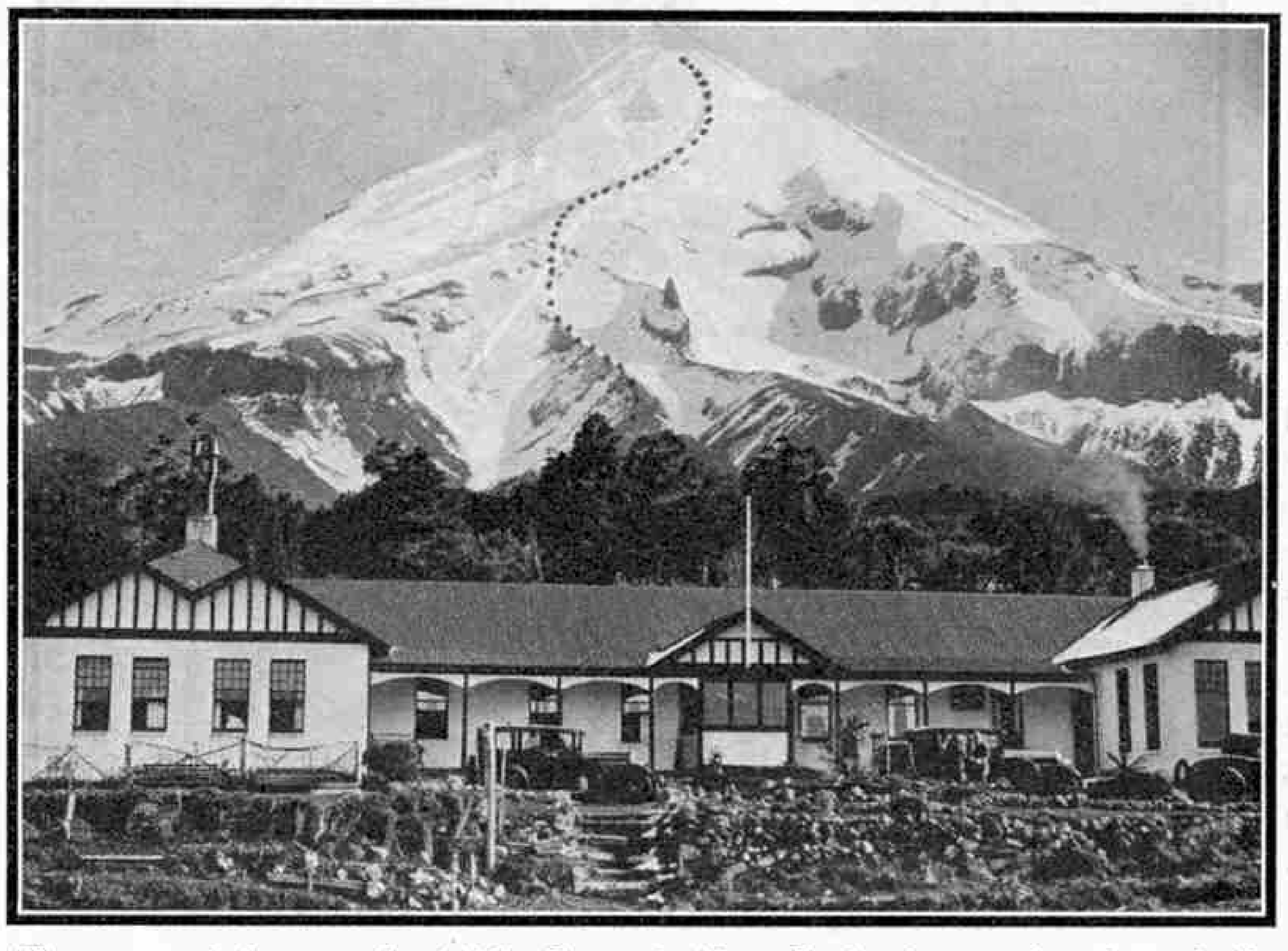
FROM OUR READERS

These pages are reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of general interest. These should be written neatly on one side of the paper only, and they may be accompanied by photographs or sketches for use as illustrations. Articles that are published will be paid for at our usual rates. Statements contained in articles submitted for these pages are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

Mountain Climbing in New Zealand

During the holidays last Christmas two friends and myself cycled from New Plymouth, the capital of Taranaki, to the Egmont Reserve with the intention of climbing Mt. Egmont. This is an extinct volcano, 8,260 ft. in height, that is remarkable for its perfect shape, the cone of Fuji Yama, the famous Japanese volcano, being its only rival in regularity of outline.

On entering the Reserve we journeyed along a four mile mountain track that took us to the North Egmont hostel. There at an altitude of 3,140 ft. above sea level we remained for the night, and when darkness fell we were able to see far below us the lights of many towns, prominent among which were those of New Plymouth, that extended for several miles along the coast.



The snow-clad summit of Mt. Egmont, New Zealand, an almost perfectly shaped extinct volcano. The dotted line marks the path to the summit.

Rain and mist compelled inactivity on the following day, but next morning we were able to commence our ascent of the mountain. The track led us through a forest of giant trees, around the trunks of which was an almost impenetrable mass of undergrowth. As we ascended, the large trees gave place to smaller ones and finally to small shrubs and coarse grass. Moss and mountain daisies succeeded, and at a height of about 5,000 ft. these also disappeared.

A little later a cloud completely enveloped us. This made climbing very difficult, and as we were without a guide it was necessary to exercise great care. For a distance of about a mile we struggled on through loose scoria, or loose volcano rock, a reminder of the days when Mt. Egmont was in active eruption. This continually gave way and rolled down the mountain side, making progress very difficult.

We had now reached the snow line, and after a hard climb over bare rocks we found it necessary to dig steps in the hard ice with the toes of our boots, for we were unprovided with ice axes. In this laborious fashion we eventually reached the summit 8,260 ft. above sea level.

A wonderful view was obtained from the sides of the now silent crater. Below us could be seen practically the whole of the province of Taranaki. To the east we could distinguish the summit of Mt. Ruapehu. This is the highest mountain in the North Island of New Zealand and is about 100 miles from Mt. Egmont. To the south stretched the waters of Cook Strait and beyond we could faintly discern the northern mountains of the South Island.

The descent of the mountain was comparatively easy. We scrambled quickly down the rocks over which we had laboriously climbed a little earlier, slid about 20 yds. down the ice, and then ran down the scoria slope to regain the mountain track. In less than an hour and a half we reached the hostel once more, although the ascent had occupied more than three hours.

J. Fairbrother
(New Zealand).

A Fortnight in a Warship

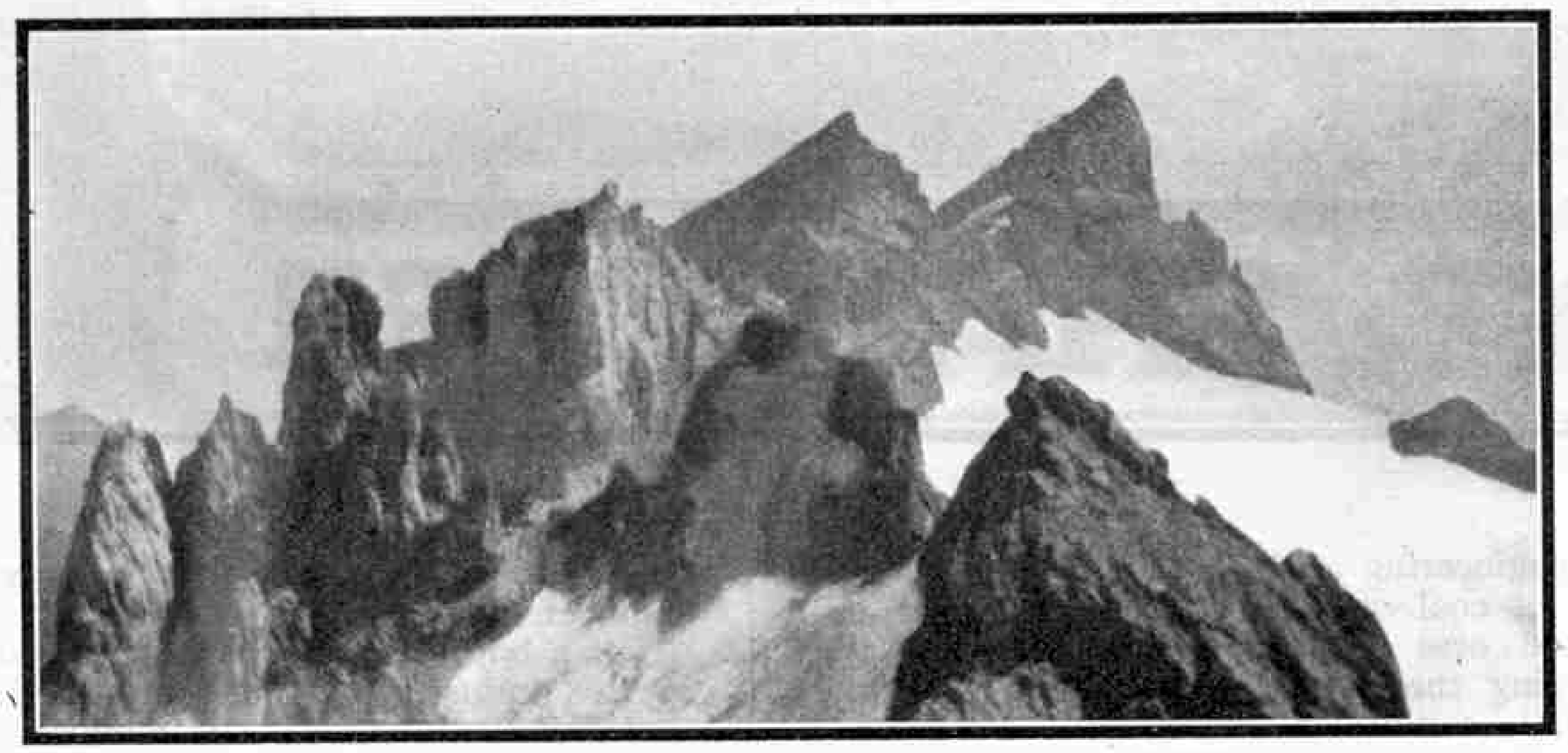
As a member of the Royal Naval Volunteer Reserve, I recently spent a fortnight in H.M.S. "*Renown*," the famous battle cruiser in which the Duke and Duchess of York carried out their world tour. It was a novelty to live for a short time in a place where the walls and doors were of steel, every passage appeared to contain enormous pipes, a hammock served as a sleeping place and machinery of all kinds was within easy reach.

During my stay I was most interested in gunnery practice. The targets used consisted of huge pieces of black canvas carried on rafts. Three of these usually were employed and they were towed to a distance of about three miles. When firing, the gunners aimed rather to "straddle" the targets than to hit them. For practice special breeches are fitted into the guns in order that a smaller projectile may be used. This is usually described as sub-calibre firing and is not so costly as firing from guns in the manner that would be adopted in time of war.

Torpedo firing is not so spectacular as gun practice. Fitted with collision heads instead of war-heads containing explosives, these speed through the water at a speed of about 30 knots, and all that may be seen of their passage is a short trail of disturbed water near the torpedo itself and an oily track, about a yard in width, that shows the course it has followed. G. P. West (London, N.6).

Climbing the Dents du Midi

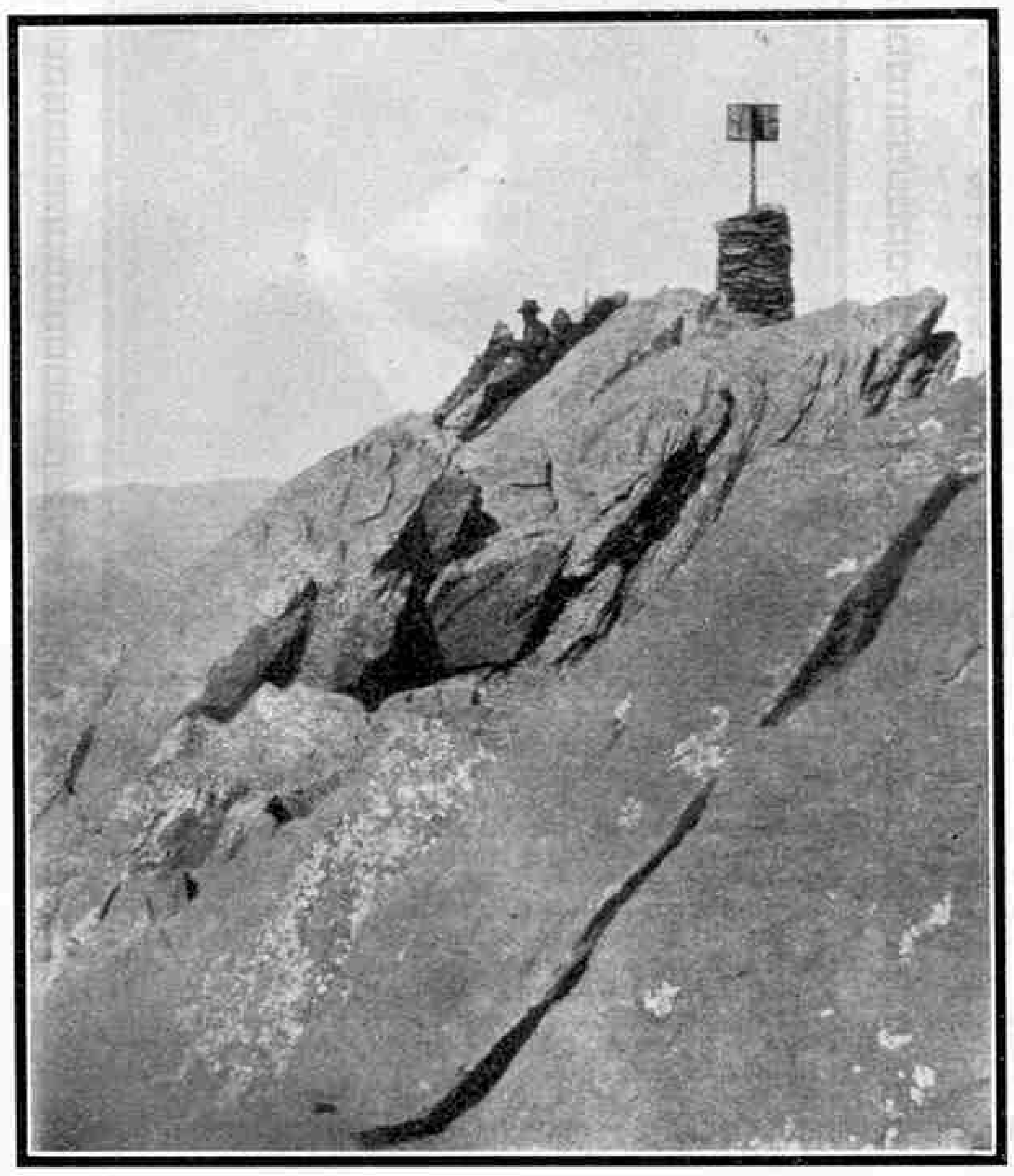
Recently I was one of a party that climbed the highest of the Dents du Midi, the well-known Swiss peaks that are visible behind the Chateau of Chillon. We set out from our hotel in the village of Champéry about eight o'clock in the evening, and in semi-darkness we walked along a wooden path to the chalet of Mettequi, relieving the tedium of the journey in the gloom by telling ghost stories.



The Dents Du Midi from the Haute Cime.

At the chalet, which is at a height of 6,000 ft., a huge bonfire blazed. Others were to be seen on every mountain height, for it was a National Fête Day, and we were surrounded by a ring of glowing peaks. We took a share in the celebrations by sending up three enormous rockets, and at 11 o'clock we retired for the night in order to be in good form for our projected climb.

Shortly after three o'clock in the morning we breakfasted on sardines, bread and chocolate. Then we followed our guide along a track over grassy slopes that led to the lakes of Anthemoz. When we set out it was quite dark and we carried a lantern in order to avoid stumbling. Progress was much more satisfactory when the sun rose. By this time we had reached a long shaly slope, up which we toiled to the foot of the rocks, and there we rested before beginning the climb of the couloir, or gorge, that confronted us.



At the top of the Haute Cime.

One of our party had been seized with cramp while struggling up the shaly slope. He was escorted back to Mettequi by another member of the group, who agreed to rejoin us at a resting place already arranged on the further side of the mountain. He did so—and while waiting for us consumed our entire stock of liquid refreshments!

The path continued over rocks, and up several couloirs to a corner, after which it followed a narrow ledge that wound along the face of a precipice. Beyond this were more rugged slopes and others covered with ice that the melting of the snow had revealed. We found the streams of ice-water very refreshing and we pressed on until we reached the ridge, where again we rested to regale ourselves on bread, chocolate and hot tea.

On resuming the climb we found the going comparatively easy, and after negotiating a short stretch of rocky ground we arrived at a long shale slope, by which we reached the summit of Haute Cime, as the highest summit of the Dents Du Midi is called. There, at a height of nearly 11,000 ft., we rested for an hour, admiring the wonderful view of the Matterhorn and other mountain peaks that were visible, and incidentally indulging in more chocolate and tea.

The descent was by a different route from that followed during the climb. At the bottom of the shale slope we found ourselves in the lonely Vallon de Susanfe, which is on the opposite side of the mountains to Mettique. There we found the path easy and fairly level as far as the Pas d'Encel. This pass is the only exit for several streams and along it we passed from one ledge to another, at one point crossing a torrent by means of a narrow board. We reached the chalet of Bonnaveau at two o'clock in the afternoon and returned to Champéry in time for tea.

A. Sandison (Croydon).

How Brass Rod is Made

During a visit to a metal works I was greatly interested in the extrusion process. In this, billets of an alloy such as brass, bronze or white metal are first prepared by melting together their constituents in correct proportions, followed by cooling in moulds. The pieces thus obtained are about two feet in length and five inches in diameter. A portion about four inches in length is cut off each end of the billet, for any foreign matter usually finds its way there during cooling.

The billets are then heated in an oil furnace and immediately conveyed to a hydraulic press in which they are squeezed through a die under a pressure of two tons per square inch. On emerging from the press the metal is in the form of rod, thin plate or strip, and is cut by circular saws into the required lengths.

Owing to the enormous pressure exerted on them the dies can only be used for one extrusion. New ones are constantly being made in the tool shop attached to the works, and the task calls for very skilled and accurate work. A great variety of extrusions are made, the products ranging from rods a quarter of an inch in diameter to thin plates six inches in width. The strips are straightened by hammering with wooden mallets.

G. C. Lund (Darlaston).

IX.—Coal Mining Engineering

In dealing with mining engineering a distinction must be drawn between the winning of coal on the one hand and the extraction of metals and ores on the other. Although the general principles underlying the two kinds of mining are the same, there are differences in conditions and methods of working. In the present article, therefore, we propose only to deal with the prospects in coal mining, and with the means of qualifying for positions as engineers in this branch of the industry.

The distinction is also advisable because coal mining is one of the basic industries of Great Britain, while only a very small amount of metalliferous mining is carried on in this country. The coal mining engineer therefore is able to gain experience and to seek his life's work at home, while one who is interested in the extraction of metals almost inevitably must go overseas in order to find a position in which he can make use of his knowledge.

At the present moment coal mining in this country is at a low ebb and there are doleful prophets who even declare that the industry is dead. Great Britain has occupied the foremost position in coal production for the last hundred years, and in spite of the depression existing at the present moment, it can scarcely be said that the industry is played out. Although year by year oil and petrol are being used for power purposes in increasing amount, and in certain countries hydro-electric power is being developed on a large scale, we yet depend very largely upon coal, which is required in enormous quantities for supplying power to locomotives, steamships, and mill and factory machinery as well as for household use.

The coal mining industry is not without prospects for a keen and energetic boy who is attracted to it, therefore. It also must be remembered that in other parts of the world are vast coal deposits of varying quality that await exploitation. As the necessity for fuel increases, and other lands are developed, mines will be sunk for the extraction of the coal at present stored up in unworked areas, and those who have already gained good experience in Great Britain may find opportunities of sharing in these developments.

FAMOUS ENGINEERS—9

Mr. Henry Eustace Mitton, M.I.C.E., F.S.I., is President of the Institution of Mining Engineers. Mr. Mitton travelled through the Yukon district in 1891, seven years before the Klondike Gold Rush, at that time being the youngest man to have penetrated into the interior of Alaska. On returning to England he took up the profession of mining engineering, and after serving in various capacities underground and at the surface became successively General Manager and Mining Agent for various companies.

At the present time Mr. Mitton is a Mining Director and a recognised authority on all subjects connected with coal mining.

The course of training that must be followed by a boy who wishes to become a coal mining engineer is decidedly arduous. Probably it offers more difficulty to the average boy than does any other branch of engineering, for it calls not only for a knowledge of engineering principles, particularly as applied to the coal industry, but also for aptitude in general science. A good knowledge of geology, ventilation and other interesting branches of knowledge are essential to a really competent all-round mining engineer.

For a boy who wishes to qualify for one of the higher positions in this industry, a good secondary or public school education is essential. Before leaving school the prospective mining engineer should obtain a Matriculation Certificate, or at least pass the School Certificate A examination. Having done so he may then enter upon a University course with every prospect of success.

It is during his University training that a mining engineer receives the education that fits him for responsible positions. Efficient departments of mining engineering may be found in many modern institutions of this type. Among them may be mentioned those of Birmingham, Cardiff, Edinburgh, Glasgow, Leeds, Manchester, Newcastle, Nottingham and Sheffield. In addition, there are several recognised Colleges of Mining such as those at Wigan and Treforest. Perhaps the best known of these is the Royal School of Mines, London, which is one of the departments of the Imperial College of Science and Technology.

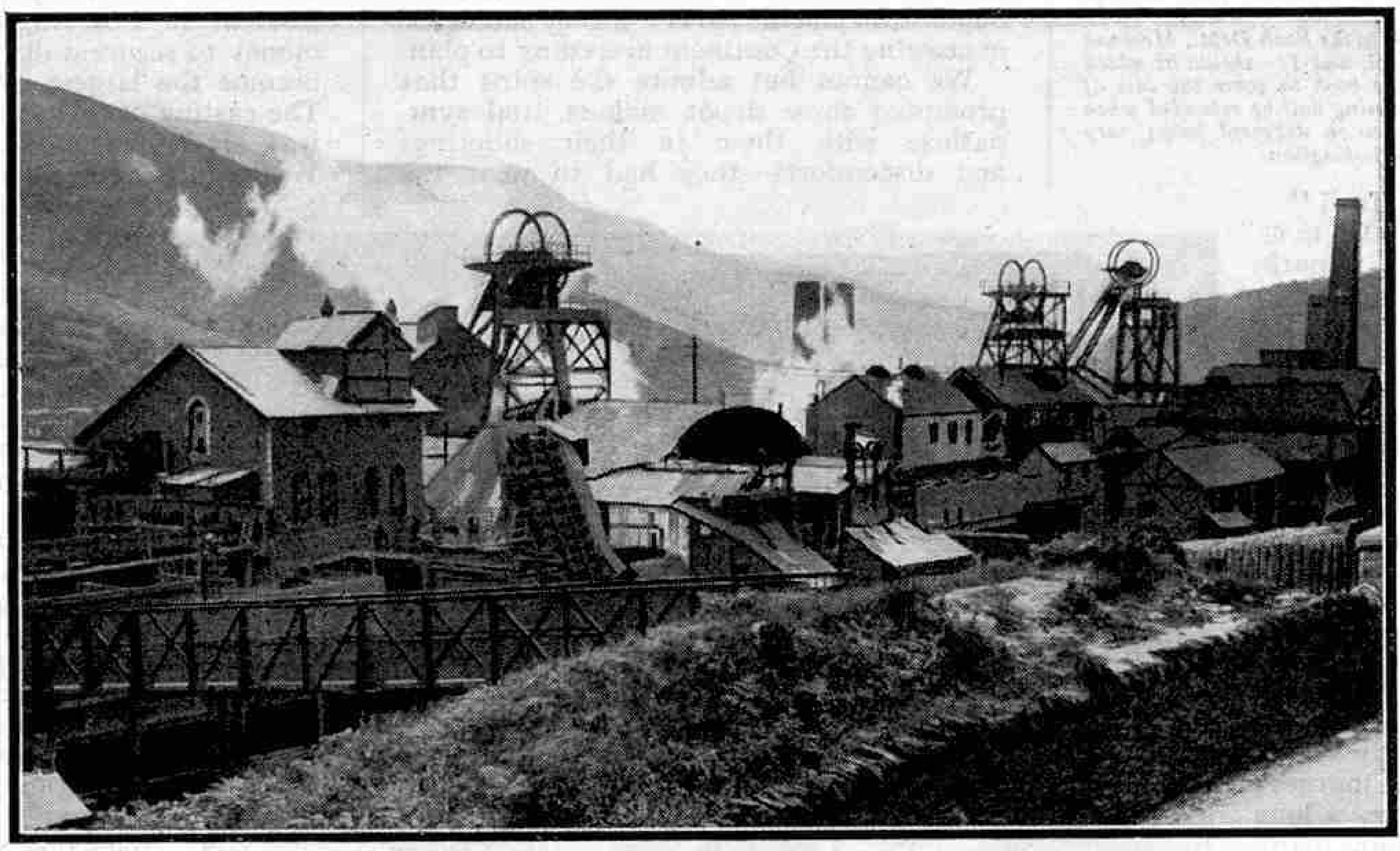
As an example of the scheme of training followed in the mining colleges and the mining engineering departments of Universities the courses arranged at the Royal School of Mines may be noted. Those who wish to become students at this College must be at least 17 years of age, and unless they have passed the Matriculation Examination or its equivalent they are required to show their ability in a fairly difficult entrance examination.

The usual practice of students is to qualify for the A.R.S.M., or the Associateship of the Royal School of Mines, in mining, and the full course occupies four years. During the first year attention is chiefly given to mathematics and mechanics, physics and chemistry. This is done in order to give the necessary grasp of the fundamental principles of engineering and mining that are taken up during the remaining three years of the course. Other essential subjects are geology, metallurgy and electrical engineering, and special courses in these important branches of science are arranged during the second, third and fourth years of the course.

The training is very complete and deals not only with shaft sinking and general work in mines, but also with surveying and with the design and construction of the machinery used in coal cutting, rock drilling and boring, power generation. It covers the whole ground of mining engineering, and it may be noted that no distinction is made between coal mining and the treatment of metalliferous lodes and veins, for the general principles are the same in both instances. In certain other colleges, especially those situated in coal mining districts, special attention is given to the branch of mining with which we are chiefly concerned. Practical work also is not forgotten and experience in surveying and underground work of all kinds are arranged at approved mines.

The student who has industriously followed such a course, and has passed the usual examinations is qualified for the Diploma of Associateship. He may follow this up by spending a further period in advanced study or research. This enables him to become a member of the Imperial College of Science and Technology. Another distinction that would be of service is degree of B.Sc. (Engineering) in Mining of the University of London, and of course students at other Universities take the corresponding degree of their own institution. The courses of study required for these are similar to that already outlined.

After leaving the University or Technical College, the young mining engineer is expected to spend two years working at the coal face as an ordinary miner, before becoming a member of the staff of a mine. In the past this condition has deterred some University graduates from entering the industry. It is now being modified. The University man must spend two years down the mine, but instead of being made to work as a labourer he is given opportunities to obtain practical experience in various capacities.



A typical South Wales coal mine at Pontypridd.

Although this compulsory two-years' work sounds very formidable, it is really very much in the interests of mining engineers, for it has helped to prevent the profession from becoming crowded. It also ensures that all men who enter the industry, and who are prepared to work hard, will be able to secure well-paid situations in a shorter time than is taken in other branches of engineering to attain similar remunerative and responsible positions of authority.

When the two-year practical course has been completed, the young engineer should seek an opening at a colliery. In some cases he will be retained by the firm who gave him his practical experience, or, if the firm with whom he was first employed is a big concern, he may be moved to another mine owned by the company.

There is the possibility that after serving his time the mining engineer will have to seek an engagement under new employers. Certain firms appear to favour University men, and such openings usually are not too difficult to obtain. There appear to be adequate opportunities for well-educated young men who have practical experience, and the young engineer who has obtained a degree and has served the usual period of two years may expect to receive a salary of about £300 a year. This may rise in a comparatively short time to £450.

With additional experience, a better post will be looked for. The next step upward is to secure a position as manager of a small colliery. This entails greater responsibility, but widens the field of experience of the mining engineer and so paves the way to such highly paid posts as general manager or agent of a big group of mine owners.

The yearly salary of a manager of a small colliery probably will be between £400 and £500. In larger concerns higher salaries are paid, and the earnings of the general manager or agent of a wealthy group of mines may be as much as £2,500 up to £6,000 a year. Positions carrying such salaries are not common, of course, and only those showing special ability, both in mining and business, may reach them.

In coal mining there is a great variety of careers open, for the extraction of coal is carried on by similar methods in practically all parts of the world. An exception is the open pit mining largely employed in the United States. There thick seams of certain classes of coal are worked by the simple process of removing the soil and rock that cover them and digging out the coal. The stripping of the overburden, as the soil and rock that must be removed is called, is carried out by means of giant mechanical and electrical shovels, and the coal itself is extracted by similar methods.

A change from the ordinary life of a mining engineer may be obtained by entering Government Service as an Inspector of Mines and Quarries. This course offers excellent prospects for fully qualified men with good experience of practical conditions underground, and only applicants with good records in this respect are considered.

An Inspectorship of Mines carries with it considerable responsibility. The initial salary is about £350 a year, and this rises by annual increments to £500. Promotion is sure but slow, and eventually higher posts carrying salaries of £750 to £850 a year may be reached. In addition, there are several highly paid senior posts, but these are few in number and only a small proportion of the staff of the department may expect to obtain them.

As is the case with other branches of engineering dealt with in this series, a professional society has been founded for the purpose of uniting those engaged in mining engineering. This is the Institution of Mining Engineers, the headquarters of which are at Cleveland House, 225, City Road, London, E.C.1. Membership of this is the aim of all mining engineers, for admission to it is a recognition of practical ability and competence. No examination is held, but aspirants must possess a recognised Diploma or Degree in mining engineering, and also must have had five years' experience as a manager, this regulation ensuring that all members shall be thoroughly practical mining engineers.

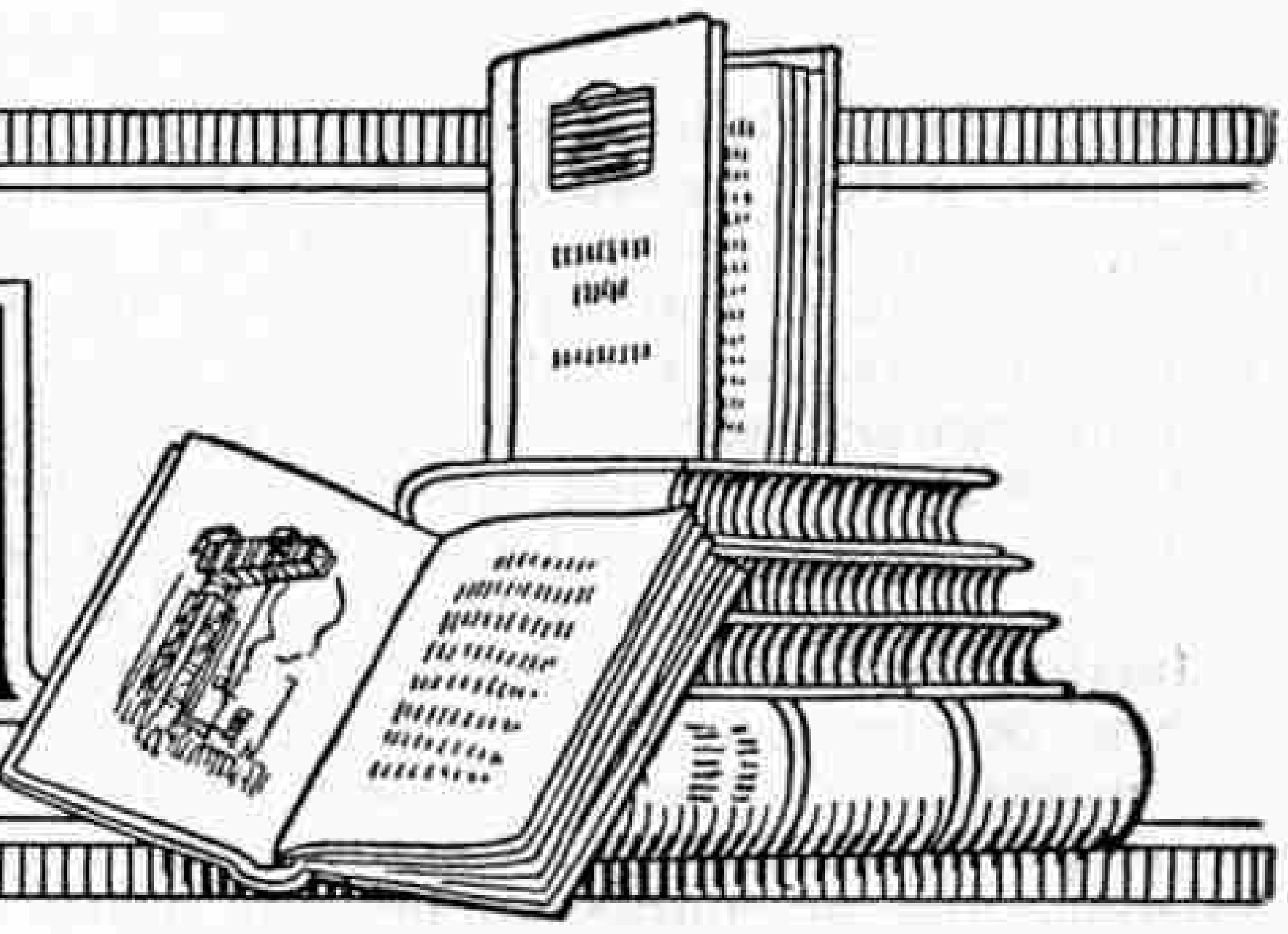
In addition to full membership there are other grades for those who have not completed their course of training or have not yet fulfilled the conditions laid down in regard to practical experience. Admission to all classes of membership may only be obtained through one of the Federated Institutes. There are seven of these, with headquarters in various parts of the country, and together they constitute the Institution. Those interested may obtain full details from the secretaries, whose addresses may be obtained from the Editor of the *"M.M."*

In addition to the careers open to a trained coal mining engineer that have already been mentioned, there are a number of others where the pay and prospects are favourable. These are directly related to colliery engineering, of course, but those who wish to adopt them must have other qualifications in addition to practical experience in coal mining, and the possession of an engineering degree or membership of the Institution of Mining Engineers.

One very interesting career of this kind is connected with the design and manufacture of mining machinery and equipment. This is a specialised branch of engineering. Naturally firms employed in it require the services of men who have had considerable practical experience underground and who are well acquainted with the conditions under which the machinery constructed will be required to operate. The number of openings of this kind is not perhaps very great, but in view of the development of coal cutting machinery and of improved means of underground transport it is one that should not be overlooked.

Another career that offers good prospects is that of a mining consultant, although this profession is of more importance in connection with metalliferous mining. Those entering it require commercial and perhaps legal training in addition to mining experience, and an engineer so qualified is able to take advantage of numerous technical and commercial opportunities.

Books to Read



On these pages we review books that are both of interest and of use to readers of the "M.M." We have made arrangements to supply copies of any of these books where readers find difficulty in obtaining them through the usual channels.

Orders should be addressed to the Book Dept., Meccano Limited, Old Swan, Liverpool, and 1/- should be added to the published price of the book to cover the cost of postage. The balance remaining will be refunded when the book is sent, as postages on different books vary according to the weight and destination.

"The South Polar Trail"

E. M. Joyce. (Duckworth. 10/6)

"I think no more remarkable story of human endeavour has been revealed than the tale of that long march. . . . You have a great story to tell." These words, addressed to the author by Sir Ernest Shackleton, speak for themselves—and for the book. The whole grim truth about life on any Antarctic expedition—of the resolutions, the sufferings and the accomplishments and failures—can never be printed. This book, which is a transcript of the log kept by Mr. Joyce on the most arduous depôt-laying journeys ever accomplished, goes a long way in bluntly revealing many hard facts of a kind that do not generally appear in books in the more romantic side of exploration.

Mr. Joyce, who had entered the Navy at the age of fifteen, had so distinguished himself in previous expeditions that he was asked by Sir Ernest Shackleton to join his Imperial Trans-Antarctic expedition. On his consenting, he was given charge of the laying of depôts—at intervals of sixty miles—from the Ross Sea to the Beardmore Glacier within six degrees twenty minutes of the South Pole. Owing to the failure of Shackleton's party, which was to have crossed the Antarctic Continent from the other side and used these depôts on their return journey northwards, they proved of no avail, and all the stores are still lying where Joyce placed them, preserved for ever by snow and ice.

Joyce and one of the dogs after a march of 1,900 miles and 200 days of sledging. (From "The South Polar Trail" reviewed on this page).

The tremendous task of equipping the depôts was only accomplished after the party had endured appalling hardships, which, indeed, killed three of them.

Trouble began early, when the ship "*Aurora*" broke away from her winter moorings in a blizzard, and the expedition was thereby hampered by lack of equipment and stores. On the first sledging journey all but five of the dogs died, which meant man-hauling a load of 200 lb. per man, and sledging for 260 days to cover a distance of 1,921 miles. Scurvy, low temperatures, snow-blindness and frost-bite all combined to make life as difficult as possible for these intrepid men. They always had before them the great fact that on the successful performance of their efforts depended the lives of Shackleton and his party—if they succeeded in crossing the Continent according to plan.

We cannot but admire the spirit that prompted these depôt makers, and sympathise with them in their sufferings and discomforts—they had to wear the same clothes for two years and had no tobacco for a like period. We can only regret that the failure of the main party, for whom they worked so willinglly and well, rendered their heroic efforts abortive.

"Fundamentals of Astronomy"

By Mitchell and Abbot
(Chapman and Hall. 15/-)

The recent discovery of a new planet has turned popular attention to Astronomy, and those who look for an informative book that gives them an outline of this science in all its phases will find that this volume meets their requirements. There are chapters on how to know the stars; some famous astronomers and instruments; the motions of the Earth; time, the calendar and navigation; the Sun, Moon, Planets and eclipses; heat, power and light from the Sun's rays; the constellations; the stars and their distances, the system of our stars and the building of the universe. The book is well illustrated with diagrams and photographs.

Our engineering-minded readers will be interested to read of the construction and erection of the 100 in. reflecting telescope at Mount Wilson. J. D. Hooker, a wealthy resident in Los Angeles, gave a sum of money to secure a disc of glass that would become the largest reflector in the world. The casting of this enormous block of glass was attempted at the St. Gobain Glass Works in France, which, only a few years later, were destroyed by the Germans during the War. It was not possible to cast the great disc in one melting and although a second lot was melted and poured on the first before it cooled, the two lots did not thoroughly combine. As attempts to cast a better disc were unsuccessful, the first one was tested and it was found that the blemish of its interior did not injure it for the purpose intended.

On the death of Mr. Hooker the subsequent preparation of the mirror and its mounting and dome were carried out by funds provided by Andrew Carnegie, the great steel manufacturer. For seven years the telescope was under construction in the shops of the Mount Wilson Observatory, and in the meantime an enormous excavation and a pier of concrete was completed on the observatory site. Next, the road up the mountain had to be widened and improved to allow the transport of the monster telescope that was to come. The dome and larger telescope fittings, which were constructed in Massachusetts, were brought round Cape Horn and landed at Los Angeles. They were conveyed to their final mountain home by motor trucks, which negotiated the hair-pin bends in a way that would have been impossible had the transport depended on the long teams of oxen or horses of earlier days. The tube of the telescope is 40 ft. in length, and together with the mounting and the mirror, weighs over 100 tons. Perfect freedom in motion was given by floating the moving parts on mercury.

The telescope is turned to follow the stars by means of a clock with a centrifugal governor that is not unlike the governor of some steam engines. The clock turns a screw that meshes with a wheel 17 ft. in diameter, the teeth of which are ground and polished to almost optical accuracy, and electric motors enable the telescope to be moved in any direction and at any speed.

Although the War resulted in the completion of the telescope being delayed, in recent years the 100 in. reflector has justified every hope and has already attained an enviable record of achievement that gives promise of great things to come.

"Metal-Work"

By H. M. Adam and J. H. Evans, A.M.I.M.E.
(Edward Arnold & Co. 6/6)

The appearance of a second edition of this interesting book affords evidence of the growing importance of handicraft work in schools. The term "metal-work" is here used in a wide sense. The first portion of the book consists of a survey of the metals used in the handicraft room, their occurrence, and the processes through which they pass before they are ready for the workshop. In some 80 pages the authors manage to convey in interesting style an excellent idea of the properties, characteristics and uses of iron and steel and the commoner non-ferrous metals, and the book would be of value for this section alone.

The remaining pages are devoted to tools and processes. The reader is taken by easy stages from simple filing operations to lathe work, and finally to such decorative processes as etching, engraving, enamelling, repoussé work, plating, etc. Quite apart from their value for teaching purposes, these chapters contain sound advice and practical suggestions that will be found of great assistance to all who are interested in metal-work of any kind as a hobby. The book is exceedingly well illustrated by a large number of photographs and drawings.

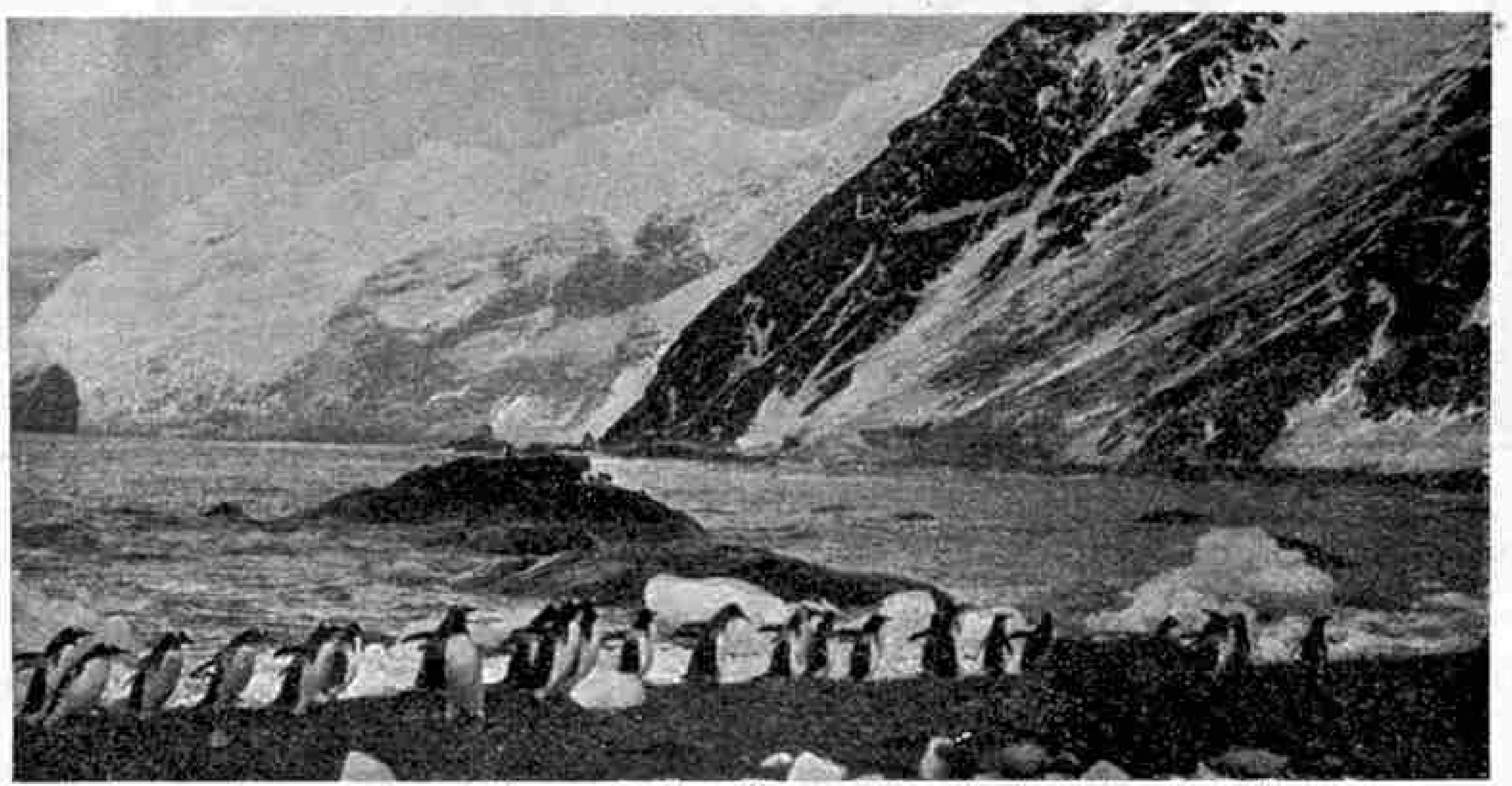
These Emperor Penguins move with stately mien (see below).

"Horological Hints and Helps"

By F. W. Britten. (Crosby Lockwood & Son. 7/6 net)

To those who possess the necessary aptitude for such work, there is no more interesting occupation than the making and repairing of clocks and watches. This is particularly the case with repairing, for clock and watch mechanisms suffer from such a variety of obscure diseases that their treatment demands experience and a high degree of skill. The author of "Horological Hints and Helps" deals with his subject in a thoroughly practical manner without ever becoming too technical. He commences with the essential lathe and its use, and gives valuable hints as to the carrying-out of various turning jobs. He passes on to deal with watches of all kinds, and this section of the book is in many respects the most interesting. Every type of watch is considered, and special attention is given to the treatment of the wristlet watches that have become so popular. There are also notes on the remarkable watch that is wound by the wrist movements of the wearer. The remaining pages deal with clocks of various kinds, ranging from the turret clock to the small portable carriage clock.

The hints given in regard to the handling of the various mechanisms are thoroughly practical and the instructions are very easy to follow. The drawings used to illustrate the book are clear, but they might with advantage have been more numerous; and a selection of photographs would have made the pages more attractive.



Penguins coming on shore after a feed. (From "The South Polar Trail" reviewed on the previous page).

"Don Quixote"

By Miguel de Cervantes
(Ward Lock & Co. Ltd. 6/-)

No one denies that Don Quixote is one of the world's greatest books, almost unmatchable for its humour. It is the story of a middle-aged Spanish gentleman who read so many romances about knights roaming the world and righting wrongs with sword and lance, that he resolved to imitate and out-do them although the days of chivalry were past.

Don Quixote believed the stories he read and tried to emulate the deeds of his heroes in circumstances unsuitable for them. Absurd adventures befel him, humiliations and disappointments. More often than not, the people he tried to help resented his interference. But throughout, he remained a great gentleman, truthful, brave and compassionate. We can no more keep from loving the poor knight than from laughing at the predicaments into which he blundered.

The story, of course, has been told many times before but in its present form it makes a strong appeal because of the 48 beautiful coloured plates that illustrate it. The volume is one of the "Prince Charming" colour books and the artist, Harry G. Theaker, has exercised his abundant imagination so that his pictures make an instant appeal. The volume is undoubtedly one of the best in a series that has a permanent place on thousands of shelves at home and abroad.

"Blacksmith's Manual Illustrated"

By J. W. Lillico
(Crosby Lockwood & Son. 9/- net)

This is a book written by a practical man for practical workers, and scarcely concerns itself at all with theoretical matters. The importance of blacksmithing is not as widely realised as it should be, for almost every kindred trade depends upon it in some shape or form. Many men who have risen to eminence in the engineering world commenced their career in the smithy. One need only instance Henry Maudslay, the father of the modern precision machine tool. As a youth at Woolwich Arsenal he became so skilful in forging light ironwork that his reputation spread into the London shops, and ultimately secured for him a place in the workshop of Joseph Bramah, thus starting him on the road to fame.

The author seeks to pass on from his own wide experience the easiest and best method of commencing and carrying out the most important types of forge work. He deals first with forges and hearths, and anvil, hand and power hammer tools; and then passes on to the important matter of the estimation of lengths of material. Then follows a series of detailed notes on a great variety of miscellaneous forgings, each illustrated by clear and simple drawings. A final section deals with hardening and tempering. This book cannot fail to be of great value to apprentice blacksmiths and all who are in any way concerned with blacksmithing work.

"Constructive and Decorative Woodwork"

By A. C. Horth
(Pitman & Sons Ltd. 2/6 net)

This volume is a further addition to the "Craft-For-All" series, and maintains the thoroughly practical nature of the series. It is distinctly a book for the home craftsman, and will be found helpful by all who dabble in woodworking, either seriously or as a casual amusement. Commencing with a simple description of the tools in common use, the work they do and how they should be handled, the author passes on to describe the operations involved in the making of simple articles such as door plates and small boxes and stands of various useful types. Then follow instructions for the more complicated operations involved in the framing of pictures and the making of such articles as folding tables and ornamental bookcases. Finally chapters are devoted to methods of wood finishing and the simpler forms of overlaid and inlaid work. The illustrations are numerous and good.

Interesting New Books

"Centenary History of the Liverpool and Manchester Railway"
by C. F. D. Marshall
(The Locomotive Publishing Co. Ltd. 30/-)

"Great Sea Mystery"
J. G. Lockhart (Philip Allan & Co. Ltd. 3/6)

RAILWAY NEWS

A "Royal Scot" built in 18 Days

The most surprising item of locomotive news to be recorded this month is that several of the new "Royal Scots," ordered only a month or two ago, are already in service! This is the result of some exceptionally smart work on the part of all concerned in the building of these engines, and especially of the staff at Derby.

As the twenty engines ordered were urgently needed for the heavy holiday traffic this summer, special arrangements were made with outside contractors for the quick delivery of the materials required and a timetable was drawn up to expedite the erection of the engines in the works at Derby. This schedule was adhered to so closely that the first engine was completed within a few minutes of the time fixed. Although the frames of this engine were not laid down until 5th May, it left the erecting shop on 23rd May, and having been painted, was ready to go into traffic on 31st May. This is a record of which Derby may justly be proud.

The other engines of the series will be turned out in regular sequence until all are completed. The design of these new engines corresponds in every detail to that of the original fifty "Royal Scots" that were built by the North British Locomotive Company Ltd.

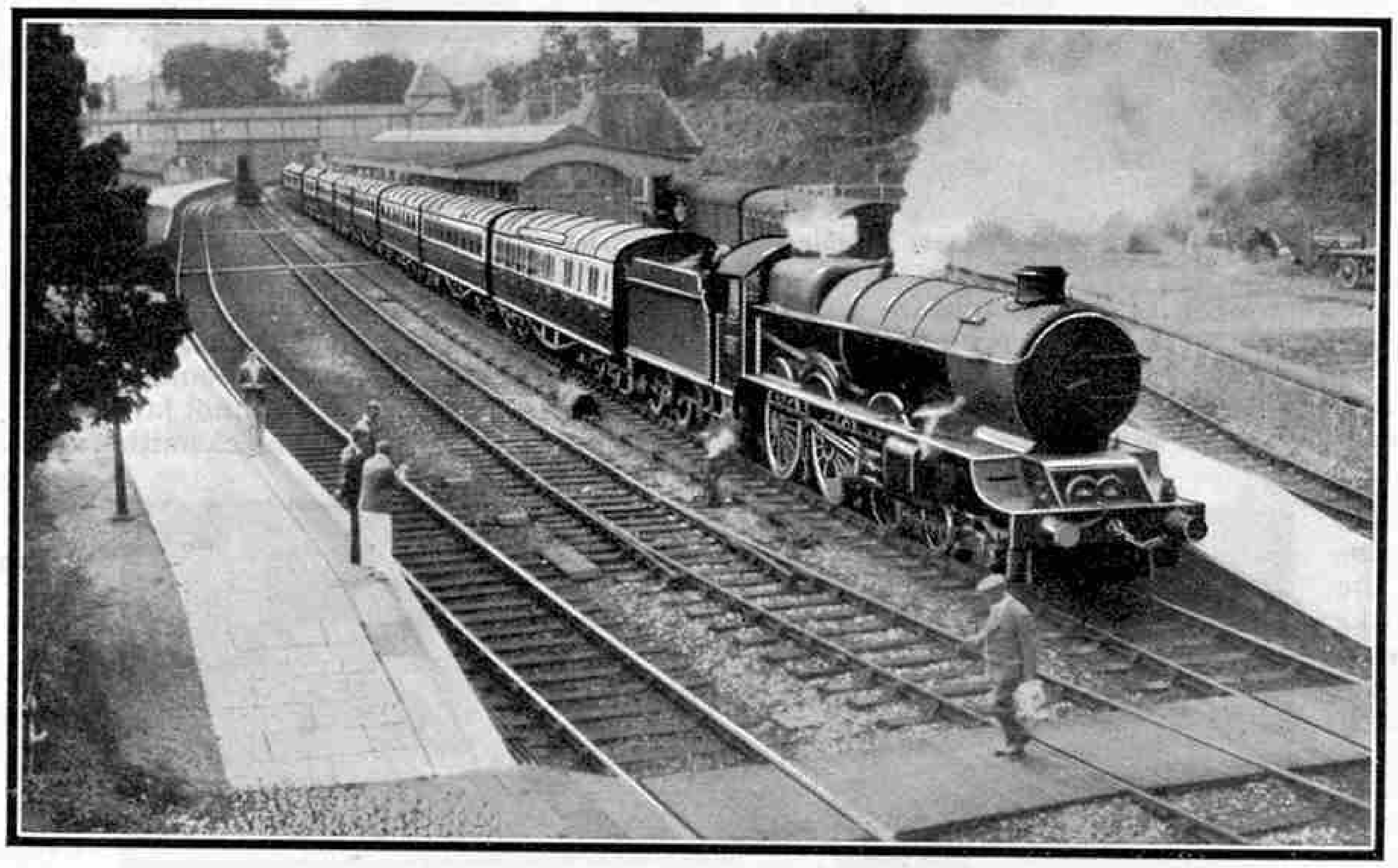
The latest 2–6–0 mixed traffic engines to be built at Crewe are numbered 13170-9. The first three of these have been sent to work on the Midland Division. No. 13178, which was completed on 22nd May, has the distinction of being the 6,000th locomotive to be built at the works at Crewe.

Additional 2–6–2 passenger tank engines have been turned out at Derby and are numbered 15505-14. Some of these locomotives have recently been seen at Lime Street Station, Liverpool.

Engine No. 5905 "*Lord Rathmore*," one of the "Claughton" class, has been altered to conform to the Northern loading gauge. Another 6 ft. "Jumbo"—No. 5092 "*Violet*"—has been consigned to the scrap heap.

Paddington to Penzance Line Doubled Throughout

The doubling of the line between Scorrier and Redruth in Cornwall, a distance of just over 1½ miles, has now been completed. This gives a double track throughout from Paddington to Penzance, a distance of 305 miles, except for a short stretch over the Saltash Viaduct.



The "*Torbay Limited*" at Torquay with one of the famous "King" class locomotives at its head. For this photograph we are indebted to our reader, Mr. H. Maden of Accrington.

New Engines for G.W.R. Suburban Services

As a result of the greatly increased passenger traffic in the London suburban area, larger engines are to be provided for these services. They will be capable of more rapid acceleration. In order to carry these heavier locomotives, two bridges on the Uxbridge section are being strengthened.

New Trains on the "Met."

Five new electric trains have been built for the Metropolitan Railway by the Birmingham Railway Carriage and Wagon Co. Ltd., and are now in service, working for the most part on the line from Baker Street to Wembley and stations beyond. The coaches are of the compartment type and the upholstery is both artistic and comfortable. Two of the trains are fitted with S.K.F. roller bearings, and it is claimed that these make for easier and smoother running, and secure economies in both power and upkeep. Their running will be watched with interest.

G.W.R. Developments

Some of the new engines of the "King" class have been completed at Swindon and put into service. The first to leave the shops was No. 6020, "*King Henry IV*," which made a trial trip on 27th May. No. 6021 "*King Richard II*," ran a first trial on 2nd June and No. 6022, "*King Edward III*" also was out before Whitsuntide.

In last month's "*M.M.*" particulars were given of some of the alterations made in the new "Kings" as compared with those of the original series. A further important alteration has been made in the engine springs and gear. Previous "Kings" resembled the "Castles" in having two equalising beams connecting the springs on each side of the engine—one between the leading and driving wheels, and the other between the driving and trailing wheels. In the new engines these equalising beams have been discarded and each spring is fixed independently of the others. It is thought that this alteration will make for steadier running. As the earlier "Kings" come into the shops for repairs they also are being altered in accordance with this later practice.

Four more 2–6–2 tank engines for goods or passenger service have been turned out of Swindon works; they are numbered 5156-9. Tank engines of the 0–6–0 type have been received from outside firms as follows:—Nos. 6704-9 from Messrs. Bagnall Ltd.; Nos. 6725-31 from the Yorkshire Engine Co.; and Nos. 7701-16 from Messrs. Kerr, Stuart & Co.

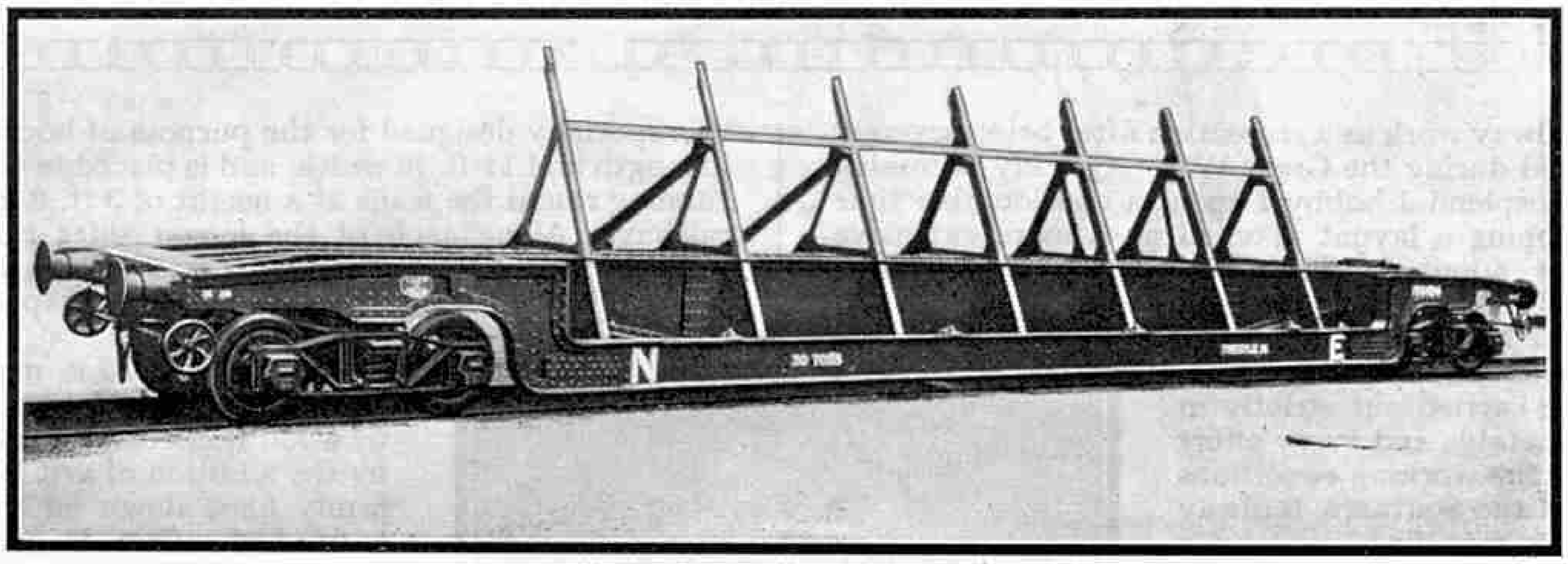
It has been decided to fit automatic electrical signalling apparatus on nearly all classes of engines as they pass through the shops. This will not only entail a great deal of work at Swindon, but also all over the system in fitting the contact rails for working the apparatus.

Re-painting Waterloo Station

Waterloo Station, the greatest of the London termini of the Southern Railway, is being re-painted. The work will take several months to complete and will cost nearly £10,000.

Trestle Wagons 60 ft. in length.

The accompanying illustration shows one of four trestle plate wagons that have been put into service by the L.N.E.R. The plates are supported by the steel trestle, which is part of the wagon. Plates up to 40 ft. in length and 13 ft 6 in. in width may be carried in this way and the capacity of each wagon is 30 tons. As will be seen from the illustration, the wagon runs on two bogies, and the distance apart of these is 50 ft. The overall length of the wagon is 60 ft., its width 7 ft. 9 in. and the height of the top of the trestle from the ground is 10 ft. 6 ins.



One of the 60 ft. Trestle Wagons that have recently been put into service by the L.N.E.R. for carrying large plates. These can be accommodated up to 40 ft. in length and 13 ft. 6 in. in height.

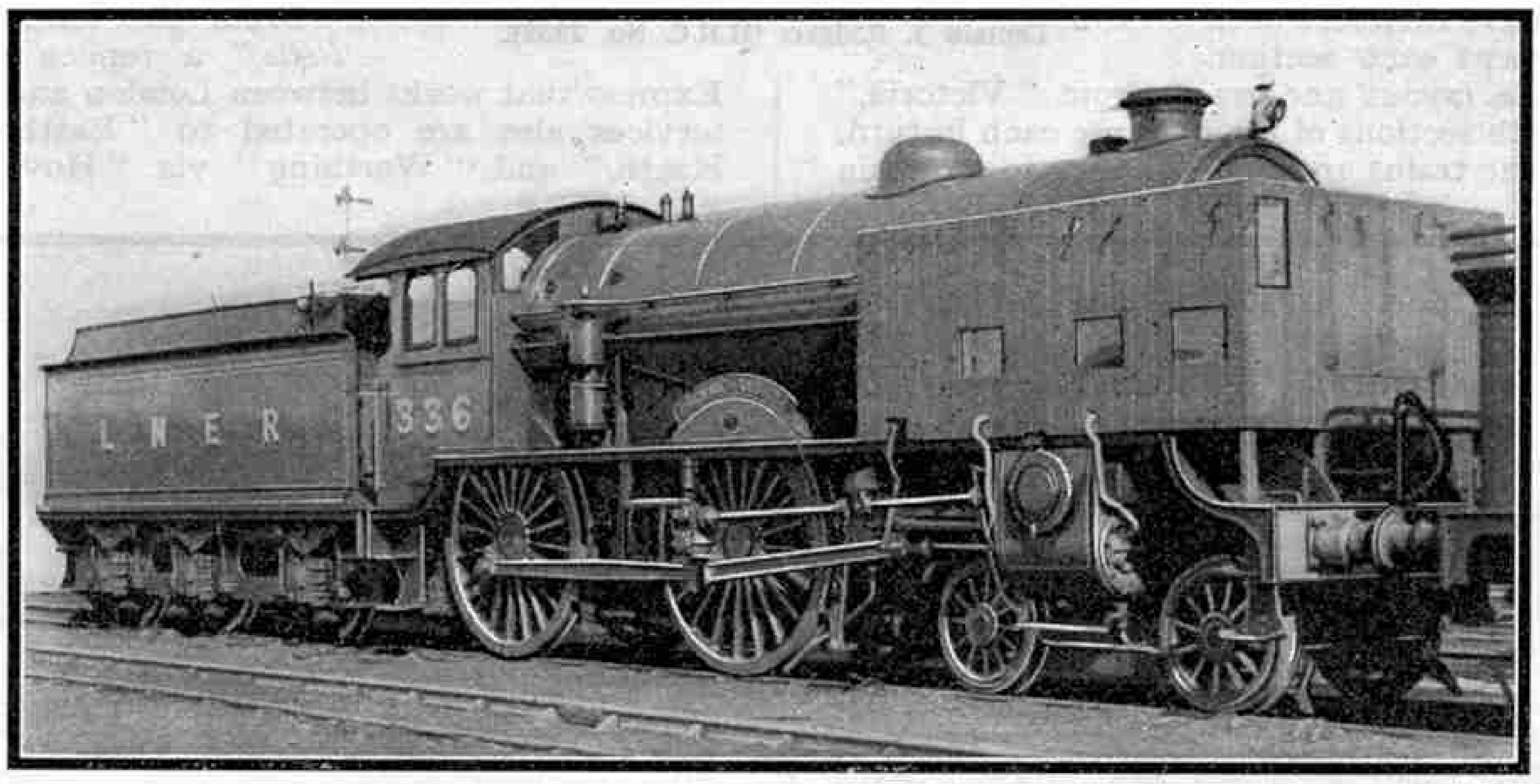
S.R. Locomotive News

The new engines of the " School " class are now nearly all at work. Although they are intended primarily for the express services between London and Hastings, it is not yet possible for them to run on that line. Some widening has first to be done to certain tunnels in order to allow the passage not only of the " Schools " but also of the latest type of coaching stock. For the present, therefore, the " Schools " are operating on other routes and acquitting themselves admirably. The first of the class, No. E900 *"Eton,"* has been thoroughly tested on some of the most difficult sections of the Southern Railway, including the long run between Waterloo and the West of England with the *"Atlantic Coast Express."*

In addition to *"Eton,"* four engines of the " School " class have now been completed at Eastleigh. Their names and numbers are as follows: E901, *"Winchester"*; E902, *"Wellington"*; E903, *"Charterhouse"*; and E904, *"Lancing."*

Five three-cylinder 2–6–0 engines of the " N1 " class are about to be completed at Ashford. Separate valve gear is provided for each cylinder.

Engine No. E460 of the " T14 " class has been rebuilt. The large splashers have been removed and a high running board substituted. The other nine engines of this class are to be similarly altered.



L.N.E.R. locomotive, No. 336, *" Buckinghamshire,"* one of the two engines of the " Shire " class that have been fitted with Lentz rotary cam poppet valve gear. The above photograph was taken by our reader, J. M. Craig, Glasgow, and shows the locomotive fitted with a shelter and apparatus for taking indicator diagrams, as mentioned in last month's " Railway News."

British Steam Locomotives

Recently published returns show that at the end of 1929, there were 23,090 steam locomotives on the principal railways of Great Britain. Of these, the L.M.S.R. owned 9,797; the L.N.E.R. 7,378; the G.W.R. 3,871; and the Southern Railway 2,044. On each line there was a decrease as compared with the total at the end of 1928. This is due to the large number of old engines that have been scrapped.

New " Pacifics " for L.N.E.R.

The L.N.E.R. are continuing the practice of naming their express locomotives of the " Pacific " type after famous racehorses. For the eight new " Pacifics " that have now been built at Doncaster, the following names have been chosen:—No. 2595 *"Trigo,"* No. 2596 *"Manna,"* No. 2597 *"Gainsborough,"* No. 2598 *"Rock Sand,"* No. 2599 *"Book Law,"* No. 2795 *"Call Boy,"* No. 2796 *"Spearmint,"* No. 2797 *"Cicero."*

" Pacifics " are now working through to Aberdeen.

A series of 0–6–0 shunting tank engines of the "J50" class are being turned out from Doncaster works. They are numbered 2784-94.

L.N.E.R. Main Line Widening

A scheme has been authorised that provides for the widening of sections of the East Coast Route main line between York and Northallerton, totalling 11 miles in all. Most of this line is at present double, with several short sections of quadruple track, and it is proposed to widen the following sections of double track:—Skelton Bridge to Benningborough to be quadruple; Alne to Pilmoor to be triple; Otterington to Northallerton to be quadruple.

Colour light signalling is to be installed throughout the 26 miles between Skelton Bridge and Northallerton. This scheme will enable fast passenger and freight traffic on one of the busiest sections of the L.N.E.R. to be dealt with more expeditiously.

Smart Running on the G.W.R.

During the relaying of the permanent way that has been carried out recently in the neighbourhood of Westbury, it was impossible for engines on the long distance expresses to replenish their water supplies at the troughs near Fairwood Crossing, and in many cases a special stop for water had to be made at Westbury. This resulted in some exceptionally good engine work, for in spite of this serious delay, the overall running times were frequently kept.

On one occasion the down *"Cornish Riviera Express"* stopped at Westbury, having run the 95.6 miles from Paddington in 91 minutes, and notwithstanding the time lost in taking water and regaining speed, Taunton, 142.9 miles from Paddington was passed in 142 minutes. On another day, engine No. 4094, *"Dynevor Castle,"* on the 3.30 p.m. express from Paddington, stopped at Westbury in 94 minutes from the start.

The *"Cheltenham Flier,"* which is timed to cover the 77¼ miles from Swindon to Paddington in 70 minutes, continues to make excellent running and frequently does the journey in less than the scheduled time. The smartest run recorded occupied precisely 62 minutes!

A Splendid Performance on the L.N.E.R.

The L.N.E.R. report a splendid run of their 3.15 p.m. Pullman Express from Harrogate to King's Cross. On a recent occasion this train was 15 minutes late at Wakefield and there were further delays of 3 minutes en route. The arrival time at King's Cross was one minute early, however, the 176 miles from Wakefield to King's Cross being covered in 167 minutes—an average speed of 63.2 m.p.h.—and the 156 miles from Doncaster to King's Cross in 146 minutes at an average rate of 64.1 m.p.h. The train was hauled by *"Atlantic"* engine No. 4444, Driver W. Sparshott and Fireman J. Beckwith.

A few days previously the same engine manned by the same crew brought the West Riding Pullman Express from Wakefield to King's Cross at an average speed of 62½ m.p.h. throughout.

Record Shunting on the L.N.E.R.

A record was created recently at Whitemoor Up Marshalling Yard when 1,629 wagons—involving 1,096 " cuts "—were shunted during one shift of eight hours. The previous record was a total of 1,375.

Miniature of the Southern Railway

Model Layout with Realistic Cross-Channel Service

By Captain J. Rodgers

I TOOK up model railway work as a recreation after being severely gassed and disabled during the Great War. Quickly becoming fascinated by this splendid hobby I spent a considerable time in building and equipping a layout planned on a more extensive scale than is usually adopted. The labour expended on this interesting task is well repaid by the pleasure I have in running on my model railway a large number of goods and passenger services. These may be carried out strictly in accordance with a timetable and every effort is made to reproduce the working conditions on the two sections of the Southern Railway on which the track is modelled.

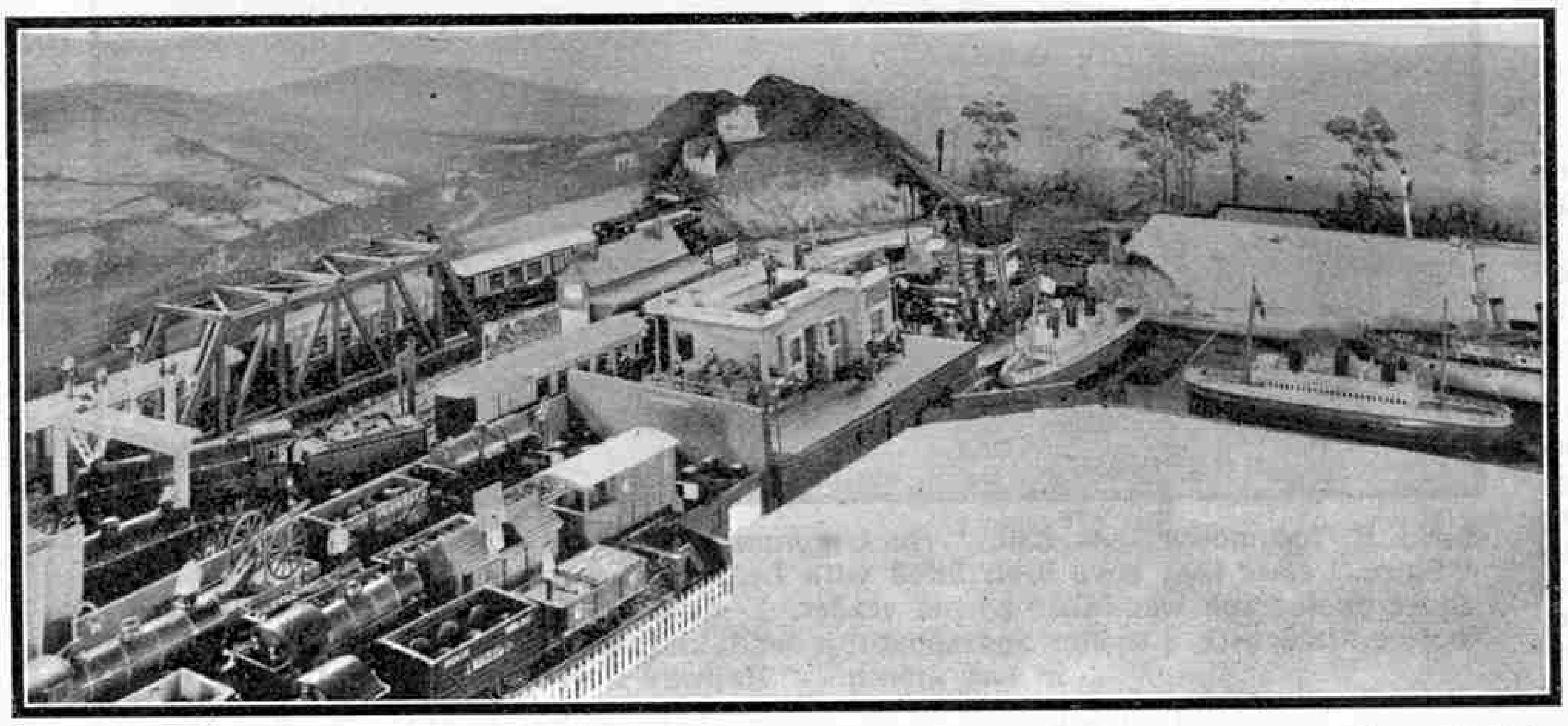
Naturally the building up of a miniature railway of this scope and size has meant a good deal of constructional work and the actual form adopted for the railway is the result of much thought and many careful experiments. The layout may therefore be of interest to other members of the Hornby Railway Company. From the description given in this article, and also from the illustrations, they may perhaps derive hints and suggestions that will enable them to improve their own miniature railways, and help them to carry out their operations in a railway-like manner, whatever their limitations in regard to space and material may be.

When the plan of the railway was being considered it was decided to model it on the Eastern and Central Sections of the Southern Railway. Owing to lack of space it was impossible to build separate main lines to all the important towns served by these portions of the S.R., and two only have therefore been constructed, one to represent each section. These run round the whole layout and trains from "Victoria," the London terminus of both sections of the line, use each in turn.

Captain J. Rodgers (H.R.C. No. 2259).

The routes followed by the trains are made to vary to a certain extent by making use of crossovers. Care also is taken to prevent trains destined for one coastal station from running through another that is not on the actual route by placing these on loop lines or sidings.

In order to give access from the main lines to the stations, crossovers are placed in suitable positions. In many cases both goods and passenger terminals are provided and on arrival trains are switched into their proper stations.



An interesting corner of Capt. Rodgers' model railway. Passengers from the "Continental Boat Express" are about to embark on a Cross-channel steamer, in order to complete their journey to Paris or the Riviera.

One great advantage of this type of layout is that the maximum amount of space is left in which to construct marshalling yards, docks, locomotive depots and general terminal stations. These may be situated in the foreground, where they are easily accessible for all operations.

The accompanying plan shows the actual layout of the model railway. The track is semi-permanently laid down in a hut that was specially designed for the purpose of housing it. This is 20 ft. in length and 11 ft. in width, and is placed in the garden. Shelving running round the walls at a height of 3 ft. 6 in. accommodates the railway. Along each of the longer sides this shelving is about 4 ft. in width, but on the shorter sides it is narrowed down by a few inches. The central space is used for operating purposes.

The track used is made of tin-plate, and gives every satisfaction. It is strengthened by wood sleepers and its appearance improved by the addition of grit ballast. The whole is firmly fixed down on the substructure, and a finished effect is given by railing the layout with Hornby paled fencing.

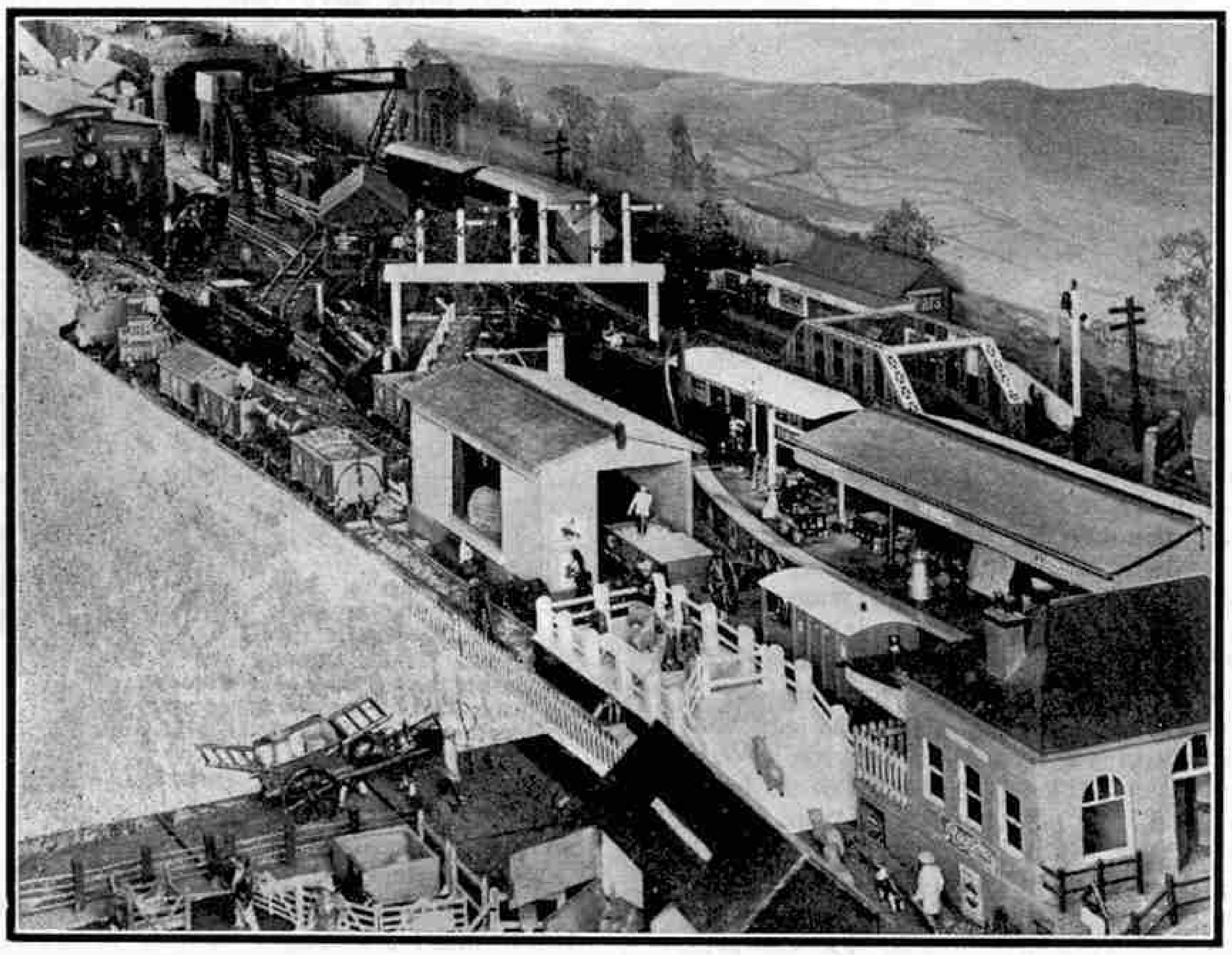
Although electric current is available, clockwork locomotives are employed, for these have been found most satisfactory for timetable working on a large scale. Another reason why the layout has not been made electrified is that the use of a third rail would complicate the working of the points, of which 50 are continually in use. The current supply is utilised for station bell signalling, however, and the chief stations, depots, and docks are electrically lighted.

Over the tracks shown a great variety of passenger and goods services are run. "Victoria" is the largest station and the traffic leaving and entering this terminus has become so heavy that recently two of the four platforms were lengthened in order to accommodate the larger number of coaches of which the main line trains are now composed.

From the terminus runs the "*Southern Belle*," a replica of the famous Pullman Express that works between London and Brighton, and passenger services also are operated to "Eastbourne" via "Haywards Heath," and "Worthing" via "Hove." These trains belong to the Central Section, of course, and an even more extensive service is provided to represent traffic on the South Eastern Section. Among the trains leaving "Victoria" on this line are the "*Golden Arrow Limited*," the Continental Boat Express to "Dover," "*The Kent Coast Express*" to "Ramsgate" via "Chatham," and numerous passenger services to "Folkestone," "Deal" and "Hastings" via "Ashford."

Even this extensive service does not exhaust the possibilities of the layout, for a "*Sunny South Express*" composed of L.M.S. coaches, runs between "Ramsgate" and "Brighton," on the South Coast, and the industrial centres of the Midlands and the North. Busy services also link up the coast towns from "Ramsgate" round to "Brighton" and "Worthing," exactly as in real Southern Railway practice.

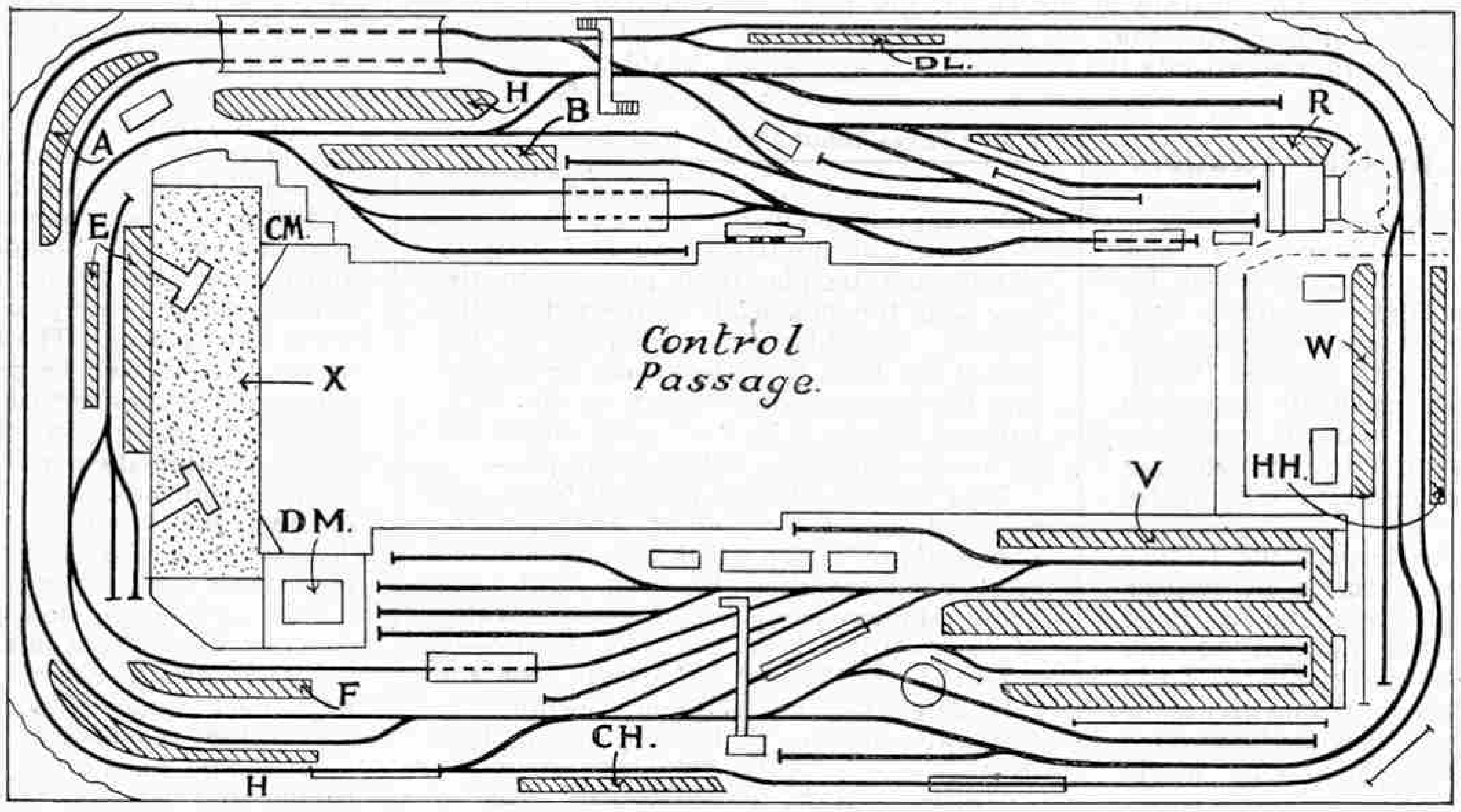
Finally "Dover" is connected with "Calais" by steamship services across a waterway that represents the English Channel. Two vessels, "*Lord Warden*" and "*Isle of Thanet*" are employed, these being fitted to take passengers and luggage, a sliding top deck giving access to the hold. Day and night services are maintained and from "Calais" models of the "*Golden Arrow*" and the "*Riviera Blue Train*" run southward on the arrival of passengers from England.


A busy section of Capt. Rodgers' layout. On the left may be seen the structures representing the S.R. engineering depot at Brighton. Produce from the model farm in the foreground is taken to London in special express goods trains.

On the layout the tracks on which these famous French trains run are not represented in full, their journeys ending in hidden sidings. The services from "Calais" that they provide are introduced in order to complete interesting time-table working from London. They also give splendid opportunities for loading and unloading operations at the docks, at which special cranes have been fitted.

The chief goods yards of the two Sections are at "Ramsgate" and "Brighton" respectively. Merchandise is conveyed from all parts of the system to the docks for shipment over the Channel to the Continent. Interesting working is obtained by the incorporation of a model farm situated alongside the railway, produce from this being despatched to "Victoria" for the London market.

A marshalling yard near the terminus deals with the empty wagons. These are shunted and sorted into various sidings for return to their correct centres. The shunting locomotives are automatically controlled, stopped and reversed from the rail and this type of control is fitted at all "through" and terminal stations and yards.



The layout of Capt. Rodgers' extensive model of the E. & C. sections of the S.R. The letters representing the stations are as follows: V, Victoria; DM, Dover Marine; CM, Calais Maritime; CH, Chatham; F, Folkestone; H, Hastings; E, Eastbourne; A, Ashford; B, Brighton; HV, Hove; DL, Deal; R, Ramsgate; W, Worthing; HH, Hayward's Heath; X is the tank representing the English Channel.

The general appearance of the railway is improved by painting Channel coast scenes on the boards that hide the waterway from the railway passing in its rear. In addition hand painted pictures of suitable character are fixed around the entire layout. For instance, behind "Victoria" are shown pictures of London as seen from the Thames; at "Dover" a view of the harbour and cliffs is displayed; and as the cross channel steamers approach "Calais," passengers on them may see "Cape Gris Nez." Representations of Beachy Head and the Seven Sisters also are being prepared, and when ready these will be placed behind "Eastbourne" station.

"Brighton" has pictures of the Downs as a background and these also may be seen in the distance from trains passing "Hayward's Heath" or "Worthing." On the plan it will be noticed that the two last-named stations are placed close together. They have been arranged in this manner because they require similar backgrounds and if possible this principle always should be followed in choosing the positions to be occupied by stations.

In operations on the layout, timetable working is possible, but naturally more than one operator is required in order to work and control all sections to the best advantage. Every effort is made to reproduce as completely as possible the conditions met with on real railways. Sectional bell and semaphore signalling are carried out and discs are attached to the fronts of the locomotives in order to indicate the type of train behind them. If desired the code employed on the actual railway may be copied.

As far as possible, signalling also is carried on as in real practice. Signal gantries built to scale are erected at the various termini and these are equipped with a complete series of home and starting signals. Others of the same type are used at every station, but owing to the large number of points and signals that would be required no attempt is made to follow real practice over the whole of the two main lines.

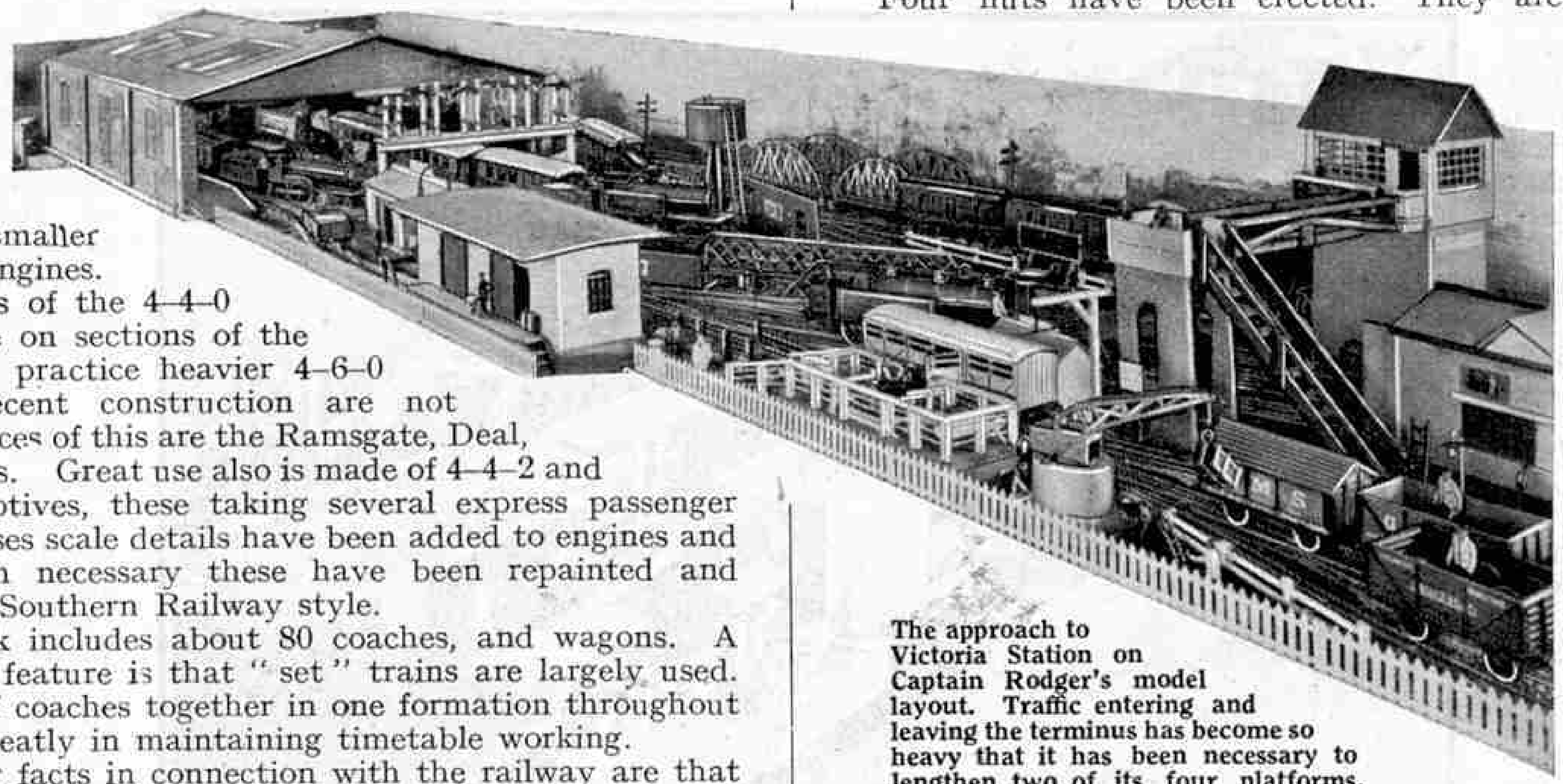
Trains are offered to the various sections by means of electric bells in the stations, a very simple code being used. If the receiving section is clear, the points and signals are set and the letter "A"—a short ring followed by a long one—is sent back to denote that the train is "accepted." If the section is occupied, and the oncoming train cannot be admitted to it the letter "D" is signalled in order to show that the offer is "declined." The code sign for this letter is one long ring followed by two short ones. When this reply is sent, the automatic stop at the entrance to the receiving section is set against the train. There it is detained until the lins is clear, and then it is passed through by signal.

Naturally the locomotives employed on this railway are kept fully employed, about 24 being in regular service. It may be thought that the number is excessive, but all are required to maintain the extensive services provided. Each locomotive is kept strictly to the work for which it is most suitable. Some are used solely for goods traffic and others are only employed in marshalling yards and in goods stations.

As would be expected, the majority of the locomotives haul main line trains. This work requires a large number of engines, for traffic is very heavy, expresses and stopping passenger trains running to no less than eight coastal towns on this side of the Channel. In addition the Continental and L.M.S. special services have to be provided for.

A further reason for using so many locomotives is that in several of the terminal stations no "run-round" can be arranged. This is the case with "Victoria," where a locomotive that brings in a train must remain penned in at the end of the platform until the coaches have been hauled away by a second locomotive.

Many types and classes of locomotives are represented, these ranging from powerful 4-6-0 "King Arthurs" to much smaller 0-4-0 shunting engines. Several locomotives of the 4-4-0 type are in service on sections of the line where in real practice heavier 4-6-0 locomotives of recent construction are not permitted. Instances of this are the Ramsgate, Deal, and Hastings routes. Great use also is made of 4-4-2 and 4-4-0 tank locomotives, these taking several express passenger services. In all cases scale details have been added to engines and tenders, and when necessary these have been repainted and lettered in correct Southern Railway style.



The approach to Victoria Station on Captain Rodger's model layout. Traffic entering and leaving the terminus has become so heavy that it has been necessary to lengthen two of its four platforms.

The rolling stock includes about 80 coaches, and wagons. A particularly useful feature is that "set" trains are largely used. Keeping a series of coaches together in one formation throughout operations helps greatly in maintaining timetable working.

Other interesting facts in connection with the railway are that there are more than 50 points and 42 signals in service. With the addition of 30 auto-control levers, this gives a total of no fewer than 122 levers that must be used in conducting operations. The total length of track is about 250 ft. This is laid down on 1,700 sleepers and 200 lbs. of fine grit have been used as ballast.

Much consideration has been given to the problem of obtaining a realistic effect throughout the system. Track, locomotives, rolling stock, railway accessories and scenery are of course, the features that are of chief importance and value in giving this, but great attention also has been paid to little details that also are very useful in this respect. For instance, a large model staff is employed, these including dock workers and farm hands in addition to employees of all grades, and the "passengers" making use of the travelling facilities afforded bring the total number of people represented up to 240.

The employment of the cross Channel steamers also helps greatly to make the work realistic. This feature of the layout has been thoroughly carried out, and no fewer than 20 gallons of water are contained in the tank that represents the Channel.

The construction of the model railway was an interesting task, and its operation affords its owner and his friends many happy railway hours. Further extension has now become a serious problem. In the original hut there is no room for expansion, except by the construction of a high and low level system. This method involves certain disadvantages, and because of these the addition of the Western section of the Southern Railway now being planned will be made in separate huts.

Four huts have been erected. They are joined together in the form of a large square, the outer measurement of which is 104 ft. This will provide excellent scope for track laying, and main lines will be laid down from "Waterloo" to "Southampton Docks" and "Bournemouth," and also to "Salisbury" and "Exeter," together with single extension tracks to "Swanage," "Weymouth," "Padstow" and "Ilfracombe." Local and loop lines will extend to "Windsor," "Aldershot," "Portsmouth," etc., the whole system giving correct non-continuous terminal to terminal operations.

The construction of the new section will take a considerable time, for about 750 additional feet of rails are required, including nearly 100 points! Passenger stations to the number of 25 must be built in addition to depots, marshalling yards and docks. A large tank, about 20 ft. in length, that holds 60 gallons of water also is being installed at "Southampton Docks" to enable Continental and American boat services to be represented.

Signalling on the extension should be very interesting, for the tracks in three of the huts will be hidden from the operators. Electric bells will be fitted in the signal cabins, and these will be wired up to be operated from adjacent sections. Warning by code will then be sent ahead of the train in a thoroughly railwaylike manner. When this section is in working order I hope to submit a further description of it, together with a general plan and photographs.

An Invitation to Our Readers

Last month we published a short review of the catalogue of athletic goods and sports materials of all kinds issued by A. G. Spalding & Bros. (British) Ltd. Readers will be interested to learn that the works at Putney Wharf, Deodar Road, London, S.W.15, are open to inspection (except on Saturdays) and an invitation has been extended by the firm to readers of the "*M.M.*" to see how sports requisites are manufactured.

Those who wish to inspect the factory should make an appointment by writing beforehand to A. G. Spalding & Bros. (British) Ltd. at the address already given, informing them that they are readers of the "*Meccano Magazine,*" and giving the suggested date of the visit and the number of people of whom the party would consist.

A general invitation of this kind has never previously been given by Spalding Bros. Ltd., and we hope that readers of the "*M.M.*" will seize the splendid opportunity of learning something of the interesting story of cricket bats, tennis racquets, hockey sticks, tennis balls, golf clubs and balls and other sporting requirements, with which the majority are only familiar when they are ready for actual use in games.

The "Take-About Two"—

(*Continued from page 523*)

of the set may be made.

The L.T. accumulator and H.T. battery should first be placed in position in the case and the flex leads connected to the former. The black wander plug on the end of the H.T. "—" lead may be pushed into the corresponding socket on the H.T. battery, but the H.T. "+" plug should not be inserted until the valves are in place.

Two valves of the two-volt type are required for the receiver and suitable valves of any of the well-known makes will give good results. In the right-hand Valve Holder should be inserted a valve of the "H.F." type, such as the Cossor "210H.F.," Mullard "PM1HF," or the "HL210" Osram, Marconi, Mazda.

A valve of the "L.F." type works best in the second Valve Holder, a Cossor "210LF," Mullard "PM1LF" or a "L210" Osram, Marconi, or Mazda, all being suitable for this purpose.

The positive telephone tag, usually marked red, is clamped under the H.T. "+" terminal of the L.F. Transformer, while the negative tag is fastened under the "P" terminal of the second Valve Holder. The H.T. "+" wander plug may now be pushed into the 63-volt socket of the H.T. Battery, and then everything is ready for listening.

The receiver should be tested first by tuning in the local station. To do this, the set should be placed so that the plane of the case is approximately in the same direction as the broadcast transmitter, and the reaction knob rotated so that the moving plates entirely cover the right-hand set of fixed plates. The knob of the on-off switch should then be pulled out and the tuning condenser rotated until the local station is heard in the phones. The signals at this stage will in all probability be quite faint and in order to increase the volume, the knob of the reaction condenser should be advanced slowly until the signals are at maximum strength.

The receiver is delightfully simple to control, and quite a number of home and foreign stations can be received in the telephones under favourable conditions. In tuning in distant stations, the set itself should be rotated in addition to the tuning and reaction controls so that the frame aerial is at maximum efficiency.

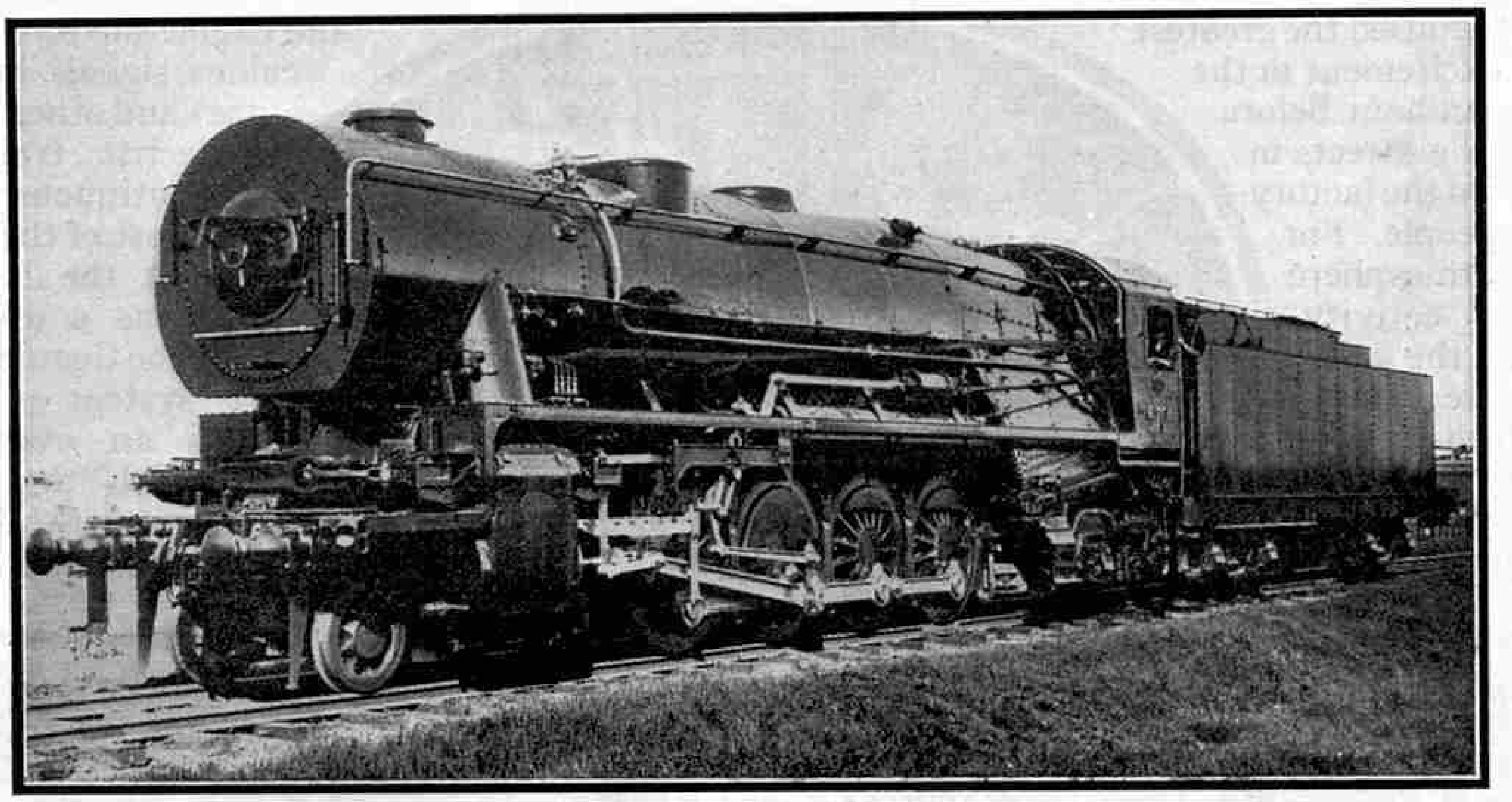
The directional properties of the frame aerial are very useful when it is required to "cut out" a powerful local transmitter and receive a distant transmission, if the latter is not in the same direction as the nearby station.

More than one pair of phones may be connected to the set if required, and there is ample room for carrying an additional pair in the case.

Australian "Mountain" Locomotives

New Freight Class for New South Wales

THE accompanying photograph shows one of the new "57" class freight locomotives for New South Wales. These locomotives have been designed by the Chief Mechanical Engineer's Branch of the New South Wales railways, and constructed by the Clyde Engineering Company Limited, of Granville, New South Wales. The tender was built by the Mort's Dock and Engineering Company, Balmain, N.S.W.



One of the new "57" class 4-8-2, or "Mountain" type, freight locomotives for New South Wales. These are the largest locomotives built in the Commonwealth.

The new "57" class are of the 4-8-2, or "Mountain" type, and have a tractive effort of 56,000 lb. The loading gauge restrictions, 9 ft. 8 in. in width and 14 ft. in height, made it impracticable to develop the power required with two cylinders, without using excessive boiler pressure, and therefore a three-cylinder design was adopted. The three cranks are arranged to drive the second pair of drivers, and revolve forward in the sequence of right, left and centre. Steam distribution to the two outside cylinders is controlled by Walschaerts valve gear in the usual manner, but the valve of the centre cylinder is operated by "Gresley" conjugating gear in front of the smokebox. The valve gear is designed with a maximum cut-off of 70 per cent. of the piston stroke.

The boiler and the firebox are of steel, while the flues, tubes and arch tubes are of charcoal iron. A superheater of 40 elements with superheater damper gear is fitted into a smokebox installed with self-cleaning apparatus that breaks up and ejects the ash. There is a mechanical stoker in which coal is fed from the tender by a worm conveyor beneath engine and tender, and driven by a horizontal engine underneath the footplate of the cab. The coal is distributed evenly over the grate by means of five steam jets. The feed-water from the tender is heated by exhaust steam from the cylinders, and forced into the boiler by a pump operated by live steam. Power reversing gear is used, and there are three 3½-in. safety valves of the muffled "pop" type.

Leading Dimensions of the New N.S.W. 4-8-2 Freight Locomotives.

Cylinders (three), Diameter	23¼ in.
„ „ Stroke	28 in.
Coupled Wheels, Diameter	5 ft.
Heating Surface, Tubes and Flues ...	3,094 sq. ft.
„ „ Arch Tubes	37 „
„ „ Firebox	259 „
„ „ Superheater	773 „
„ „ Total	4,163 „
Grate Area	65 „
Boiler Pressure	200 lb. per sq. in.
Tractive Effort	56,000 lb.
Tender Capacity, Water	9,000 gals.
„ „ Coal	14 tons
Total Weight in Working Order ...	229 tons 19 cwt.
Length Overall	83 ft. 11 in.

As will be seen from the photograph the chimney is unusually short, being only about 9 in. above the smokebox. An innovation on N.S.W. railways is the large sandbox on top of the boiler between the chimney and the dome. The power reverse is situated immediately above the brake cylinder, while part of the automatic stoker mechanism may be seen under the cab. At the lower extremity of the firebox, and on each side of the engine, is an ash dumper. The end of the third cylinder, which is inclined, may be seen underneath the smokebox, and its valve gear between it and the buffer beam. On the front of the smokebox is a small platform, on which will be mounted the headlamp that is a standard feature on N.S.W. locomotives. The small turbo-generator that supplies current for the headlamp and the cab lights will be mounted on the small platform that can be seen near the cab just above the handrail.

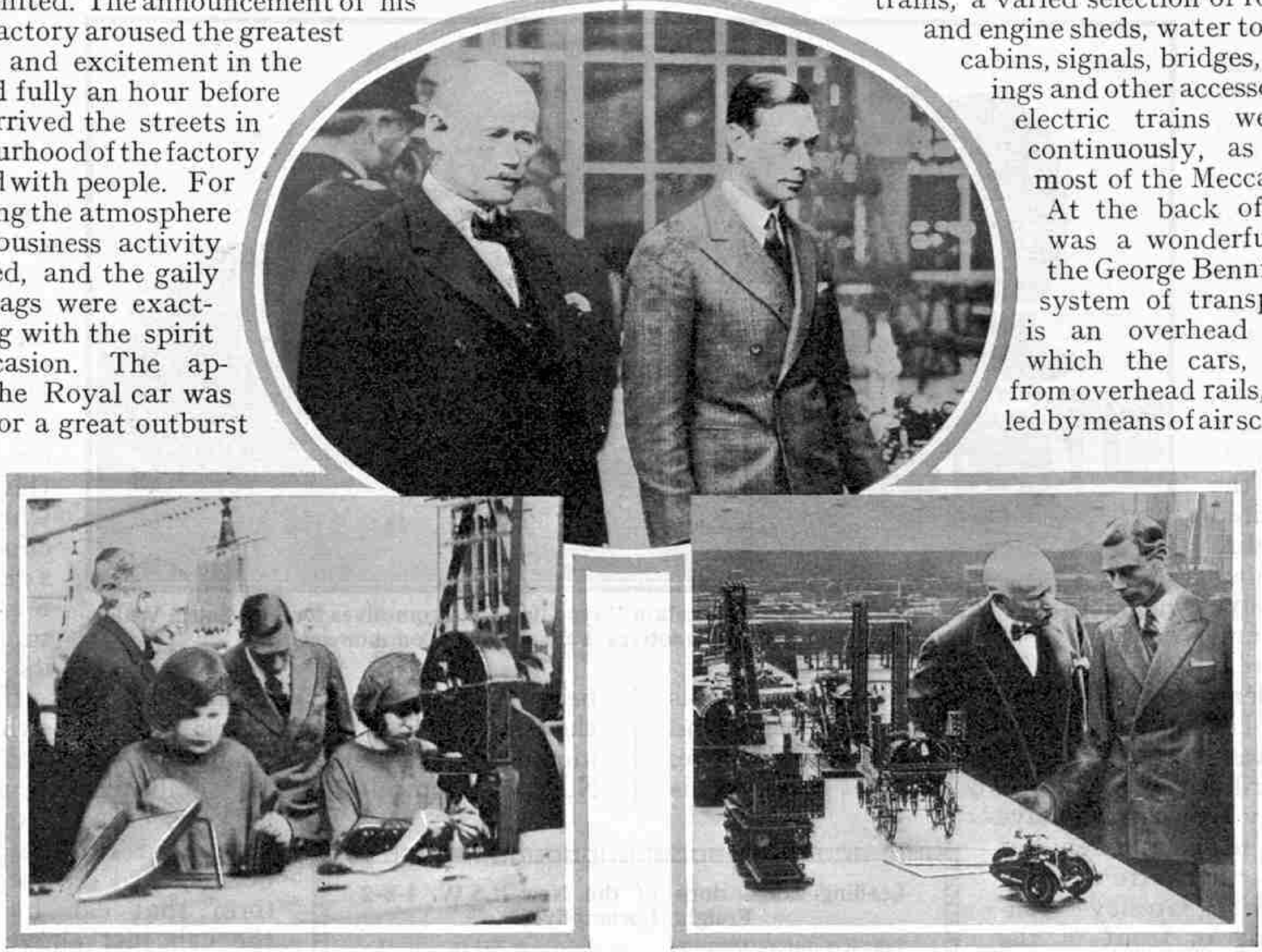
The new locomotives are designed to handle traffic over the Blue Mountains. From Emu Plains, 35½ miles from Sidney, there is practically an unbroken climb to Mount Victoria, 78¾ miles, including many sections with a grade of 1 in 35. The main object of the new engines is to haul bigger loads over this mountain section, and without the assistance of the banking engines that have been necessary in the past. Tests of the new locomotives show that they are capable of hauling loads of 1,200 tons on a gradient of 1 in 80; of 580 tons on 1 in 40, and 410 tons on 1 in 33, in each case at a speed of 15 m.p.h. They will operate trains of up to 1,000 tons at 40 m.p.h.—ALLEN HINES, ENFIELD, N.S.W.

Duke of York Visits Meccanoland

A Hornby Train for Princess Elizabeth

HIS Royal Highness the Duke of York has for many years taken a keen interest in the work of the Industrial Welfare Society and in the industries of the country generally. On the occasion of his visit to Liverpool to open the Congress of the National Safety-First Association, the Duke took the opportunity of visiting two of Liverpool's greatest factories. One of the firms to be honoured in this manner was Meccano Limited. The announcement of his visit to the factory aroused the greatest enthusiasm and excitement in the district, and fully an hour before the Duke arrived the streets in the neighbourhood of the factory were packed with people. For the time being the atmosphere of serious business activity was banished, and the gaily fluttering flags were exactly in keeping with the spirit of the occasion. The approach of the Royal car was the signal for a great outburst of cheering, which reached its climax as the entrance to the factory was reached.

The Duke was received by Mr. Frank Hornby, Managing Director of the firm, who, as the inventor of Meccano, is famous among boys of every nationality and in every part of the world. The Duke was attended by Commander Harold Campbell, D.S.O., and the party included the Lord Mayor of Liverpool, Sir Benjamin Johnson, Mr. F. J. Marquis, Chairman of the Liverpool Organisation, the Chief Constable of Liverpool, and other officials. After a few minutes' conversation the party commenced a tour of the great factory, visiting first the Train Assembling Department, where some hundreds of employees are engaged in completing, testing and packing the locomotives, rolling stock and innumerable accessories of the Hornby Railway System. The staff had received instructions that there was to be no demonstration of any kind until the signal was given by the sounding of the factory siren, so that his Royal Highness saw the various processes being carried on under normal everyday conditions.



(Above) The Duke of York watching the wonderful display of working models ; his Royal Highness was particularly interested in the operation of a large model dock. (Left) Watching the fitting of bosses to three-inch Pulley Wheels. (Right) Another view of the model display. Mr. Hornby explains the details of a model of the "Sanspareil," beyond which is a fine model of the "Rocket." Other models in the foreground are Motor-Cycle and Sidecar, Breakdown Crane, and "Baltic" Tank Locomotive.

The Duke was conducted to a display of Meccano working models and Hornby Trains that had been specially prepared in this department. The models were arranged on a table, 30 ft. in length by 10 ft. in width, and in the centre was a large Hornby Train layout equipped with different types of trains, a varied selection of rolling stock, and engine sheds, water towers, signal cabins, signals, bridges, level-crossings and other accessories. Two electric trains were running continuously, as were also most of the Meccano models. At the back of the table was a wonderful model of the George Bennie Railplane system of transport. This is an overhead system in which the cars, suspended from overhead rails, are propelled by means of air screws driven by electric motors. Friction is reduced to the minimum by the general use of ball and roller bearings, and it is claimed that speeds of well over 100 m.p.h. should be attainable. The Meccano model is 20 ft. in length, and the car, driven by an electric motor, travels swiftly backward and forward, reversing itself automatically at each end of its journey.

A group of models that attracted the Duke's special attention, and about which he asked several questions, included the well-known Meccano "Baltic" Tank Locomotive, mounted alongside a model of George Stephenson's "*Locomotion,*" the first locomotive to haul passengers along a railway. These two models are built to the same scale and thus, by contrast, they afford a striking illustration of the development of the railway locomotive during the past century. In this group were also models of three of the locomotives that took part in the famous Rainhill Trials organised by the promoters of the Liverpool and Manchester

Railway, as the result of George Stephenson's strong recommendation that steam locomotives should form the motive power for the line. These three were Stephenson's "*Rocket*," which won the contest; the "*Sanspareil*" and the "*Novelty*."

His Royal Highness repeatedly expressed his appreciation of the speed and skill with which the employees carried out the various detailed operations. (Above) Mr. Hornby explains a stage in the line assembly of Hornby points. (Centre) One of the spraying units in the large Department recently installed for the spraying of Meccano parts and Hornby Trains; the girls engaged in this work wear overalls that cover them from head to foot. (Below) The Pulley Finishing Department; the Duke is examining a revolving screwdriver that is used for inserting set screws into Pulley Wheel bosses.

Other models that his Royal Highness inspected with obvious interest were the Meccano Loom, Motor Chassis, Block-setting Crane, Battleship, Traction Engine, Grandfather Clock, and a three-engined Biplane. The Biplane was suspended above the display, and its three propellers were whirled round in the most realistic manner by an electric motor incorporated in the fuselage. Another section of the Meccano display that the Duke particularly admired consisted of a representation of a Liverpool dock, complete with gates, a bucket dredger, a steam tug-boat, barges, coal-handling plant, warehouses, etc. There wereelectric lamps along the quayside, a tiny traction engine hauled a heavy load on a trailer, red lights flashed intermittently at the entrance to the dock, and Hornby Trains were stationed alongside the coaling plant.

"This reminds me of my boyhood days," said the Duke, as he looked round with interest at all these models busily at work.

Leaving the display, his Royal Highness walked along one of the assembly benches where he saw Hornby Railway Points being made. The various parts of the points are deposited on a conveyor at one end of the bench, so that they pass from one machine to the next as the different processes are carried out. The first six operations are taken up in securing together the different parts by means of automatic presses. The Duke was greatly interested in these operations, and taking up sections of the points examined them closely, while Mr. Hornby explained in detail the complete process of manufacture. Passing along, the Duke watched a number of girls carrying out soldering operations, and others engaged on what is known as "gagging," that is securing the ends of the wires connecting the pivoted tongue of the points to the control lever. Other girls fix the eyelet that holds the pivoted tongue in place, test the finished points as they arrive on the conveyor, and finally pack the points in their boxes and pass them on to a conveyor leading to the stores. This assembly bench is capable of producing 1,000 complete sets of points per day of 8½ hours.

The party next moved across to the transferring bench where girls letter and number the sides of Hornby locomotives and wagons; and from this bench the Duke watched the Hornby accessories passing on to the conveyor and so into the "Dwell" room, a special department from which dust is rigorously excluded and which is maintained at a uniform temperature. Here the parts are dried and then varnished, the varnish being forced on in the form of a fine spray by means of compressed air. From this room the goods pass on to a very slow conveyor that travels through the drying ovens.

The Duke next visited a section of the Press Shop and watched the marvellous automatic presses hard at work making various Meccano parts. One machine stamps out Perforated Strips at the rate of 200 strokes per minute; each stroke cuts out four Strips, so that the output is 800 Strips per minute! The machine is capable of producing annually a total of about 4,000,000 Strips. Close alongside is another press that makes Double Angle Strips at the rate of 164 per minute, each stroke producing two complete Strips. Yet another press makes Hornby Rail Connecting Plates at the rate of 110 per minute. The Duke also saw here machines making Hornby Carriage Wheels. Each of these machines produces the wheels, formed up complete, at the rate of 90 per minute, and has an annual output of about 1,250,000 wheels. His Royal Highness also inspected the rail-forming presses, which together produce approximately 7,000,000 rail pieces a year.

In the Enamelling Room the Duke watched girls, each covered from head to foot in overalls fitted with hoods, standing before spraying tanks and manipulating the compressed - air "guns" by means of which enamel is directed on to Meccano parts in the form of a very fine spray. While the parts are being sprayed they move slowly forward on a chain conveyor towards the drying ovens. Each tank has enamel of a different colour, and the combined effect, as one enters the department, is strikingly brilliant.

Finally his Royal Highness passed through the Packing Department where the Meccano Outfits are assembled accurately and at top speed, and so reached the Shipping Department, which has many interesting features. In one corner the Duke saw goods sliding down a spiral chute from the stores above. Each packing table is fitted with rollers, so that as the

(*Continued on page 592*)

Results of
Meccano Model-Building Contests

By Frank Hornby

"Christmas" Competition (Overseas Section)

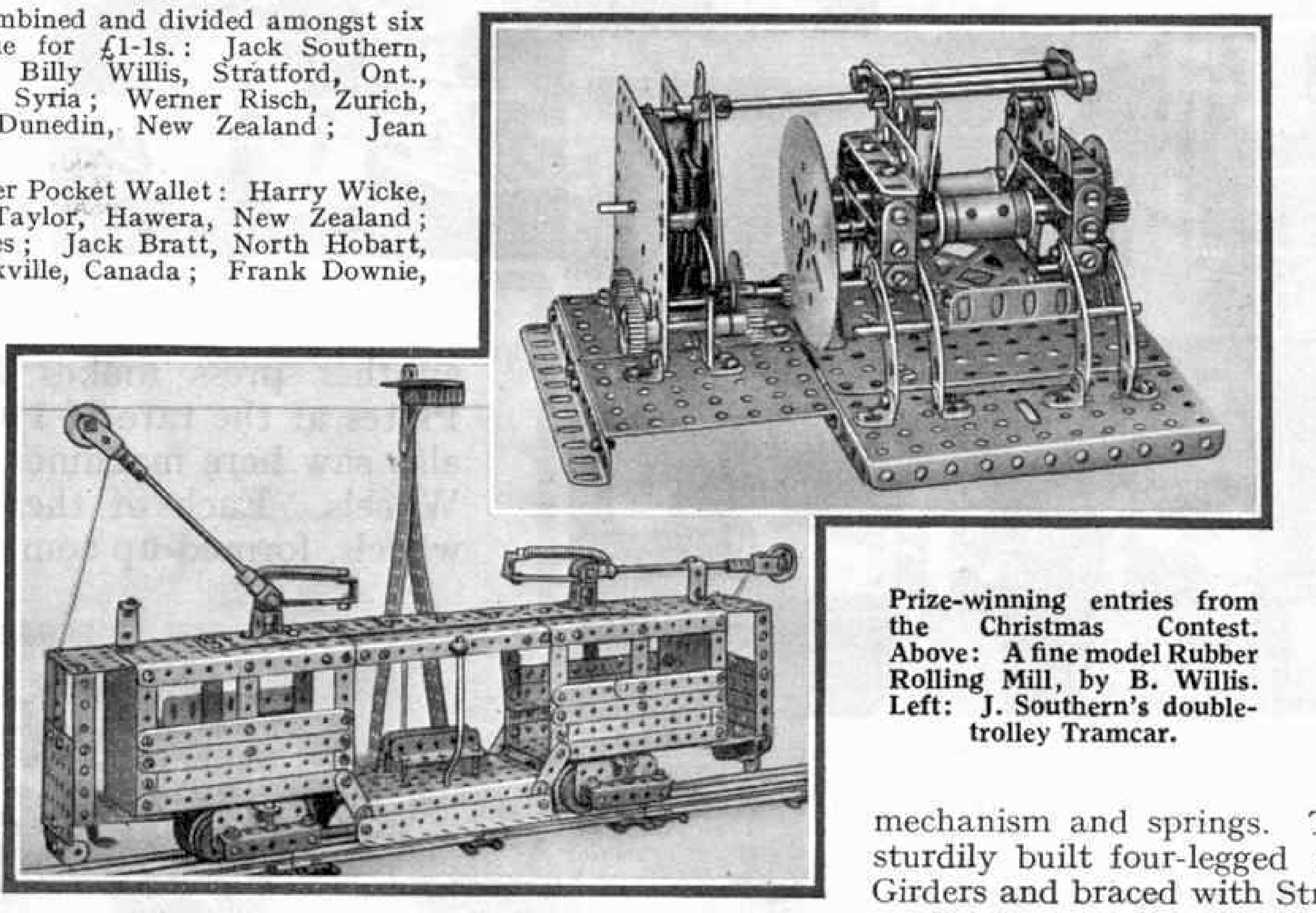
THE judges of the "Christmas" Contest found it very difficult to allocate First, Second, and Third Prizes in the Overseas Section owing to the fact that no less than six models were considered worthy of first place ! Finally it was decided to combine the first three prizes originally offered and to divide the total amongst the six entries. The complete list of prize-winners is as follows :—

FIRST, SECOND, and THIRD PRIZES combined and divided amongst six competitors, each receiving cheque for £1-1s. : Jack Southern, Kew, E.4, Victoria, Australia ; Billy Willis, Stratford, Ont., Canada ; K. Aboul-Zahab, Beirut, Syria ; Werner Risch, Zurich, Switzerland ; Tony MacLachlan, Dunedin, New Zealand ; Jean Degol, Brussels, Belgium.

SIX PRIZES, each consisting of a Leather Pocket Wallet : Harry Wicke, Manly, Sydney, Australia ; Ian Taylor, Hawera, New Zealand ; P. Woodman, Tenerife, Canary Isles ; Jack Bratt, North Hobart, Tasmania ; George Whalley, Brockville, Canada ; Frank Downie, North Hobart, Tasmania.

TWELVE PRIZES, each consisting of Meccano products to value 5/- : R. J. Ranikhetvala, Bombay, India ; David Siddons, Ranfurly, Alberta, Canada ; Max Wallace, Wanganui, N.I., New Zealand ; P. Anagnostopoulos, Athens, Greece ; A.M.C.v.d. Broek, Utrecht, Holland ; R. Baylis, Cape Town, S. Africa ; Alan C. Price, Parkview, Johannesburg, S. Africa ; J. Balhan, Amsterdam, Holland ; B.D.H. J. Silva, Colombo, Ceylon ; Peter D. Potts, Glen Iris, Melbourne, Australia ; F. Voskuyl, Baarn, Holland ; O. Maag, Zurich, Switzerland.

TWELVE PRIZES, each consisting of a copy of a Meccano Engineers' Pocket Book : Jim Warburton, La Tuque, Que., Canada ; John Pearce, North Sydney, Australia ; Jack Noble, Wellington, New Zealand ; Emile Hugel, Mulhouse, France ; Edwin v.d. Grijp, Utrecht, Holland ; Murray Lester, Hawera, New Zealand ; C. Hulls, Wellington, New Zealand ; J. A. Laskaris, Athens, Greece ; D. C. Tzitzinias, Salonica, Greece ; D. J. Richardson, Epsom, Auckland, New Zealand ; G. Neustead, Glen Iris, Melbourne, Australia ; J. J. Punaar, Johannesburg, S. Africa.



Prize-winning entries from the Christmas Contest. Above: A fine model Rubber Rolling Mill, by B. Willis. Left: J. Southern's double-trolley Tramcar.

Billy Willis well earned his prize with the neat model of a rubber rolling mill, illustrated herewith. He owes his success mainly to the neatness of his work and the manner in which he has avoided unnecessary complications in the drive transmission gear.

Belgium is represented amongst the principal prize-winners by Jean Degol, who entered a sturdily built model of an excavator. The jib with digger arm is mounted on a swivelling turntable constructed from two Circular Girders, between the flanged edges of which run $\frac{1}{2}$" Pulleys. One of the Girders is fixed to the framework of the jib and the other to the travelling base of the model.

Jack Southern sent a model of a street tramcar. It represents one of the double-bogied single-deck vehicles common in Melbourne, as will be seen from a glance at the accompanying illustration. The interior of the tram is specially roomy and airy—an important feature of the actual trams, which, of course, operate in a county where the sun is nearly always shining. Melbourne trams are fitted with two collector trolleys, one at either end, so that there is no necessity to reverse the trolley when the direction of travel of the tram is reversed. Instead, one trolley is removed from the conductor wire and drawn down to the roof of the tram out of the way, and the other trolley is released and placed in contact with the overhead wire. The constructional details of the model are well shown in the illustration.

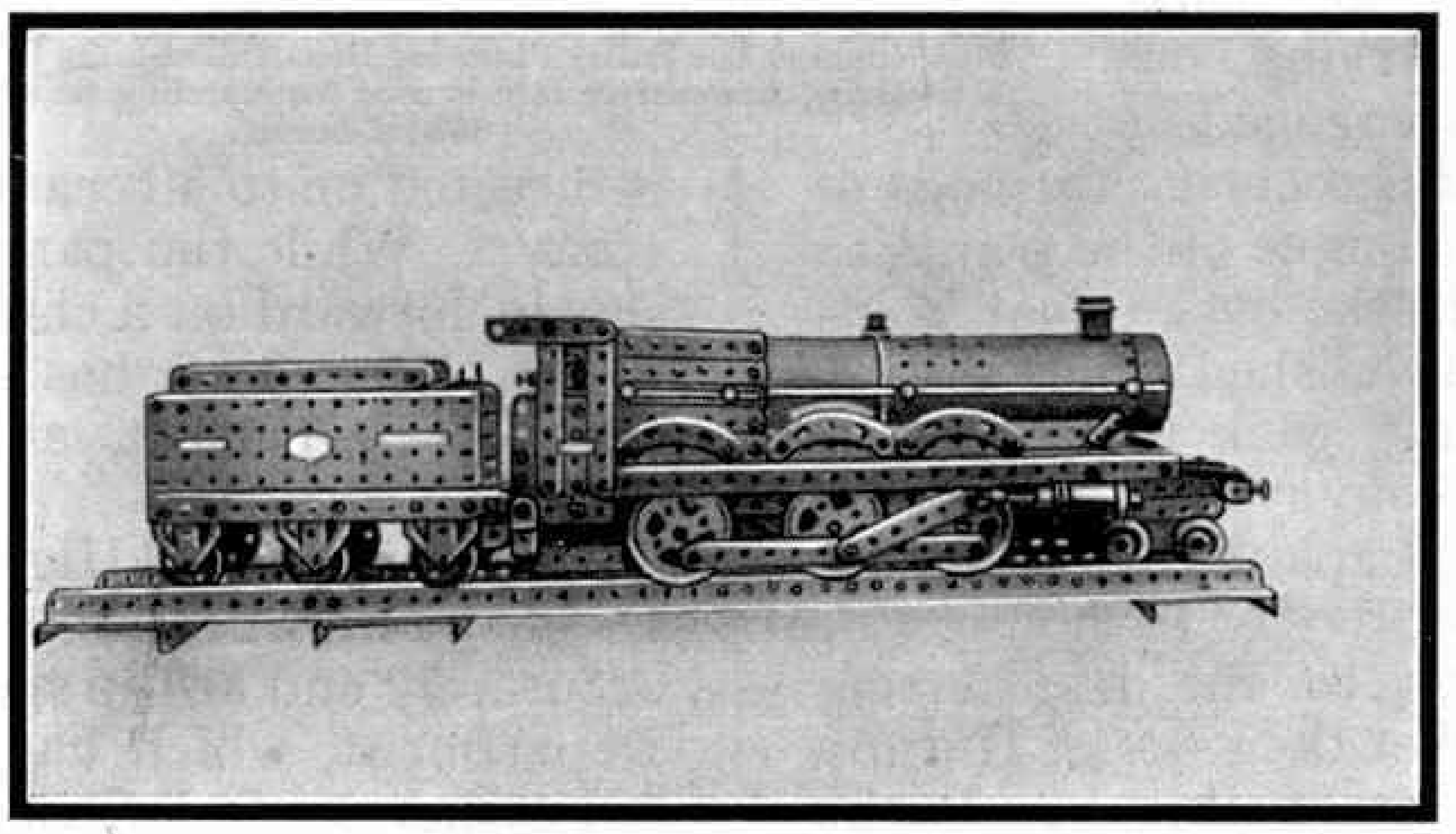
Werner Risch built a splendid model of a stationary type steam engine and boiler. I hope to illustrate and describe this model in a special article that will appear in the "*M.M.*" in due course.

Tony MacLachlan secured his award with a small but realistic model of the well-known G.W.R. locomotive "Windsor Castle." Cab fittings include regulator, steam gauge, fire box door, etc., and the tender is fitted with water tank, coal slide and hand brakes.

K. Aboul-Zahab's entry is particularly interesting, for it can be put to practical use. It is a full size treadle-operated fret-cutting machine and is built entirely from Meccano parts. A very substantial saw frame is constructed from Angle Girders bolted together to form channel section girders, and the saw blade is held taut by means of an ingenious screw mechanism and springs. The frame is supported on a sturdily built four-legged stand, composed of Angle Girders and braced with Strips. The treadle comprises a number of Flat Plates and is pivoted on a Rod. It operates, by means of a connecting link, a crankshaft that carries a 3" Sprocket Wheel. This is connected by Sprocket Chain to a smaller Sprocket Wheel on a shaft that carries also an Eccentric. The arm of the Eccentric is attached pivotally to the lower arm of the saw frame, to which it imparts a reciprocating motion.

An automatic "penny-in-the-slot" amusement device attracted attention chiefly because it is particularly well constructed and possesses originality. It was built by Harry Wicke, and with the exception of two small pieces of glass and a piece of cardboard, is constructed entirely from Meccano parts.

To operate the machine, a penny is placed in the slot and a lever is pulled, which sends the penny along a chute provided with slots numbered 1 to 5. If the coin falls through slot No. 1 it is returned automatically to the player, but should its momentum carry it past the first slot it may drop into slot No. 2, when it slides down an incline into a drawer, which opens automatically to receive it. Sometimes it may happen that the coin passes both slots 1 and 2 and drops through slot 3. In this event the player is in luck, for in dropping through this slot the coin operates a system of levers which release the drawer just mentioned, so that the player can pull it open and take out all the pennies it contains ! If the coin falls through slots 4 or 5 it is irretrievably lost to the player, for it falls to the bottom of the machine and finally wanders into the pocket of the owner of the game. Wicke informs me that he has spent many an exciting evening in the family circle with this little device, as each member tried his or her luck.



A good example of locomotive construction. G.W.R. "Windsor Castle," built by Tony MacLachlan.

Results of "New Year" Competition (Overseas Section)

THE models submitted by overseas readers in the "New Year" Competition are decidedly interesting, and in the majority of instances the constructional details have been carried out with great care and skill.

Although the subjects chosen by competitors include practically every branch of engineering, certain subjects received greater attention than others and motor cars and aeroplanes, as usual, were reproduced in hundreds. After careful examination it was decided to make the awards as follows :—

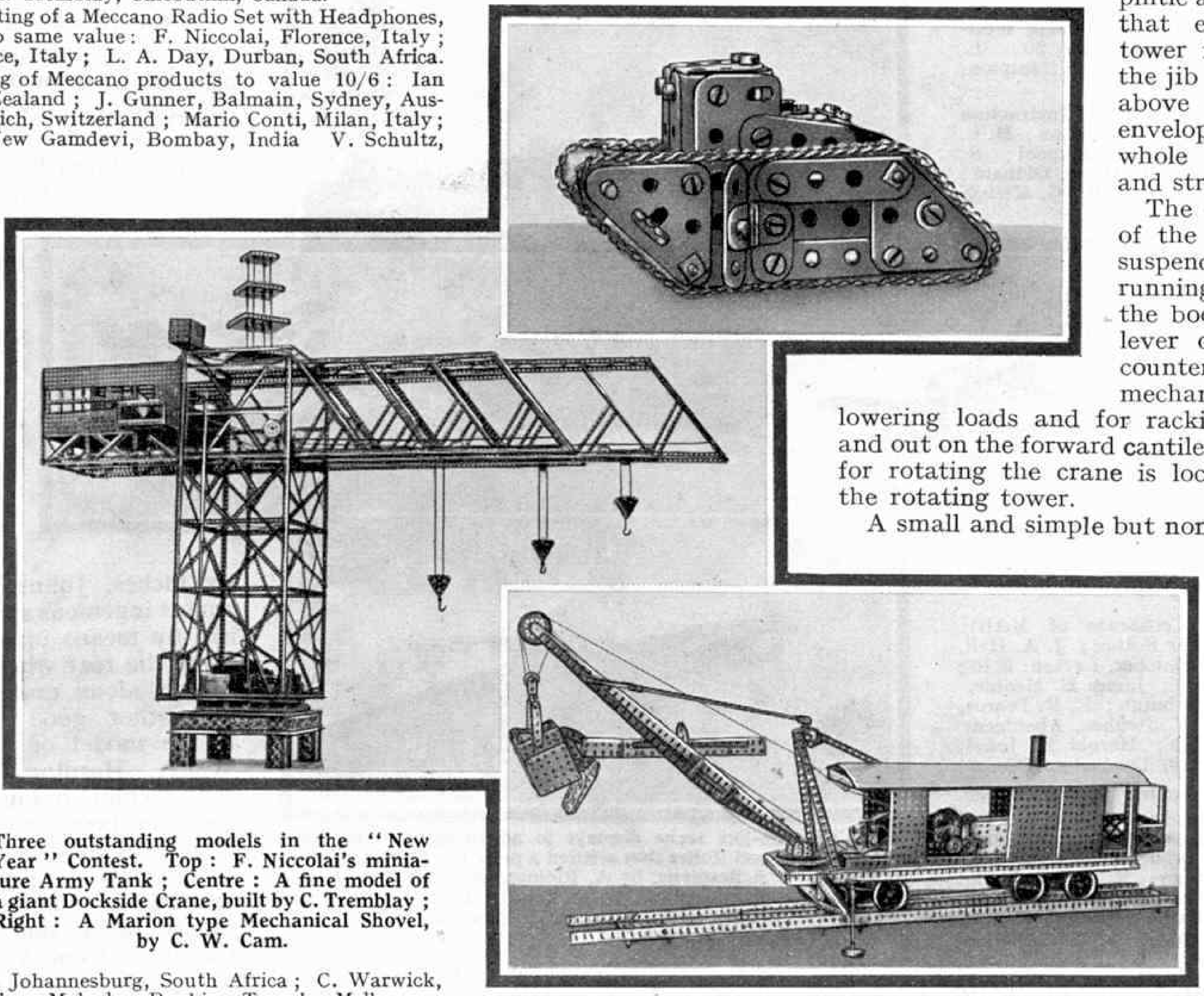
FIRST PRIZE, cheque for £3-3s. : C. W. Cam, Montreal, Canada ; SECOND PRIZE, Cheque for £2-2s. ; C. E. Tremblay, Chicoutimi, Canada.

THREE PRIZES, each consisting of a Meccano Radio Set with Headphones, or Meccano Products to same value : F. Niccolai, Florence, Italy ; P. L. Bargellini, Florence, Italy ; L. A. Day, Durban, South Africa.

SIX PRIZES, each consisting of Meccano products to value 10/6 : Ian Taylor, Hawera, New Zealand ; J. Gunner, Balmain, Sydney, Australia ; E. Zangger, Zurich, Switzerland ; Mario Conti, Milan, Italy ; D. R. Heeramaneck, New Gamdevi, Bombay, India V. Schultz, Basel, Switzerland.

TWELVE PRIZES, each consisting of Meccano products to value 5/- : A. S. Adams, Durban, Natal, South Africa ; Frank Shaw, Queenstown, South Africa ; Mrs. P. N. Senji, Madras, India ; J. Kutter, Johannesburg, South Africa ; R. F. Williams, Calgary, Alberta, Canada ; D. C. Tzitzinias, Salonica, Greece ; D. Ellerbeck, Boksburg, Transvaal, South Africa ; H. Curry, Windsor, Nova Scotia, Canada ; K. Winch, Kilkenny, S. Australia ; R. Himburg, Dunedin, New Zealand ; Maurice Nicklinson, Hunua, Auckland, New Zealand ; John A. Rodriguez, Montreal, Canada.

TWELVE PRIZES, each consisting of a Meccano Engineers' Pocket Book : J. Sharpley, Hawkes Bay, New Zealand ; F. J. Blundy, Burwood, Melbourne, Australia ; Eric Smith, Johannesburg, South Africa ; C. Warwick, Dunedin, New Zealand ; Malcolm Rankin, Toorak, Melbourne, Australia ; B. D. H. J. Silva, Colombo, Ceylon ; Robert W. Chapman, Edmonton, Canada ; W. Watson-Armstrong, Walcheren, Zeeland, Holland ; J. Vogtborg, Stockholm, Sweden ; Ivor Zolinski, Warsaw, Poland ; R. Meadway, Cairo, Egypt ; M. Levant, Lyons, France.



Three outstanding models in the "New Year" Contest. Top : F. Niccolai's miniature Army Tank ; Centre : A fine model of a giant Dockside Crane, built by C. Tremblay ; Right : A Marion type Mechanical Shovel, by C. W. Cam.

The excellent reproduction of the well-known Marion type Railway Steam Shovel with which C. W. Cam secured First Prize is illustrated herewith. Shovels of this type are designed specially for handling coal. In the model the drive is taken from a centrally-placed Electric Motor that operates four gear shafts, each of which is controlled by a lever. The model can carry out all the movements of the prototype, i.e., travelling, swivelling, racking of the digger arm, and digging. Ordinarily the Motor is running free and each movement is entirely independent of the other three. The constructional details are well carried out and it is quite evident that Cam has put considerable effort and thought into his work.

Charles Tremblay might well feel proud of the fine model of a hammerhead crane with which he won the Second Prize, for it is one of the best entries of this nature that I have seen for some time. The model is based on the description, which appeared in the "*M.M.*" for January last, of the great 350-ton crane installed in the League Island Navy Yard at Philadelphia, U.S.A. Some idea of the immense size of the prototype may be gained from the fact that a 10-storey building could be placed under the jib of the crane! Its over-all height is 245 ft., or about that of a 17- or 18-storey building.

A special feature of the model is the fact that it incorporates three Meccano Electric Motors. One of these drives the pulley block trolleys and operates the blocks, of which there are three separate sets. Another is employed exclusively for rotating the superstructure and the third Motor operates an elevator by means of which the crane driver ascends to the control cabin that is situated on the boom. The three hoisting blocks may be raised or lowered separately or simultaneously, so that their combined power can be utilised in raising a very heavy load. Under test the model has been found capable of easily lifting a load of 70 lbs.

The model consists essentially of a fixed base surmounted by a tower-like rotating superstructure, which supports the cantilever jib or boom. Here it must be mentioned that the model differs slightly from the prototype, for the actual crane incorporates a fixed portal supporting on strong girders a conical tower that carries at its upper end a bearing pintle. The jib turns about this pintle and carries a "skirt" that envelopes the fixed tower from the bottom of the jib down to a point just above the portal. This enveloping skirt makes the whole crane very stable and strong.

The three pulley blocks of the Meccano model are suspended from travellers running on rails built into the boom The rear cantilever of the jib carries a counterbalance and the mechanism for hoisting and lowering loads and for racking the travellers in and out on the forward cantilever. The machinery for rotating the crane is located at the base of the rotating tower.

A small and simple but none the less interesting model of an Army Tank won a prize for Fabrizio Niccolai. The model is illustrated and does not need special comment.

P. L. Bargellini struck a very original note in choosing the subject of his model. It is an Electric Generator and not only does it constitute a distinct departure from ordinary Meccano model-building, but it actually produces electric current! The armature, or rotor, is composed of eight wound bobbins, joined together in series and suitably supported radially round a central shaft. The current is picked up by two rings composed of copper wire wound on a little band of insulated tape on the armature shaft. The stator comprises thirteen separate coils. In constructing dynamos and motors in Meccano a great many technical difficulties have to be overcome, not the least of which is the task of obtaining a sufficiently small clearance between the armature and stator. Bargellini is to be congratulated on the fact that he has managed to overcome most of the difficulties with a large degree of success.

A model of a Titan block-setting Crane, built by L. Day, featured prominently amongst the entries. Four levers in the cab control all the movements of the model, which comprise hoisting and lowering the load, swivelling the jib, traversing the crane trolley to and fro along the jib, and the travelling of the entire model. The model runs on rails and the drive is provided by an Electric Motor, the power being transmitted through a gear ratio of 27 : 1 by means of long Rods running from the gear box in the cab and carrying Bevels at their lower ends, which engage Bevels connected to two opposite bogies.

A model of one of the world's largest and most powerful fire engines formed J. Gunner's entry. The prototype is capable of pumping water at an average rate of one thousand gallons per minute! The model is a faithful representation of the original, and includes many well-planned details.

Ian Taylor submitted a Marine Engine of the reciprocating type, and D. R. Heeramaneck secured his prize with a most ingenious model of Attwood's Machine. The constructional details and workmanship embodied in this model are excellent.

Results of Meccano Competitions—(*Continued*)

Second "Simplicity" Model-Building Contest (Home Sections)

In each Section of this Competition several competitors tied for the First, Second, and Third Prizes, and after very careful consideration it was finally decided, in order to treat all competitors fairly, to combine these prizes and to divide the total amongst six competitors whose entries were ultimately judged the best. Under this system prizes were awarded to the following competitors :

Section A (for competitors over 14 years of age).

First, Second, and Third Prizes combined and divided amongst the following six competitors, each receiving Meccano products to value 12/6 : A. M. Johnston, Dunstable ; A. C. Masterman, London, N.W.1 ; A. E. Ridings, Uphall, West-lothian ; S. Revell, London, S.W.20 ; E. Gillespie, Glasgow, S.W.2 ; A. L. Hampson, Widnes.

Six Prizes, each consisting of a bound Instruction Manual : J. B. Frost, Newton-le-Willows ; H. E. Tomlinson, Thornton-le-Fylde, Blackpool ; R. Foster, Dorchester, Dorset ; F. Miller, Oldham ; W. Harding, Perranporth, Cornwall ; G. Kerley, London, N.W.10.

Twelve Prizes, each consisting of a copy of "Famous Trains" by C. J. Allen : B. Morgan, Cardiff ; J. L. Spashett, Kingsway, Dovercourt Bay ; Mr. Best, Leeds ; F. Hoskins, Southampton ; S. Batchelor, London, S.E.4 ; G. H. Emery, Birmingham ; A. V. Tidcombe, Bristol ; R. P. H. Jackson, Spalding ; James F. Huson, London, S.E.19 ; O. Pask, London, W.3 ; W. W. Harbord, Normandy, Near Guildford ; A. Holmes Peterborough.

Specially Commended (Certificate of Merit): Frank Mills, Kearsley, near Bolton ; J. A. Hall, Birmingham ; R. B. G. Fletcher, Leyton, E.10 ; R. K. Moore, Birmingham ; James H. Moonie, Aberdeen ; S. Smith, Edinburgh ; R. R. Pearce, Bishop's Stortford ; A. W. Stephen, Aberdeen; J. R. Blamire, Edinburgh ; Harold E. Jones, London, E.4 ; T. D. Ray, Lancaster.

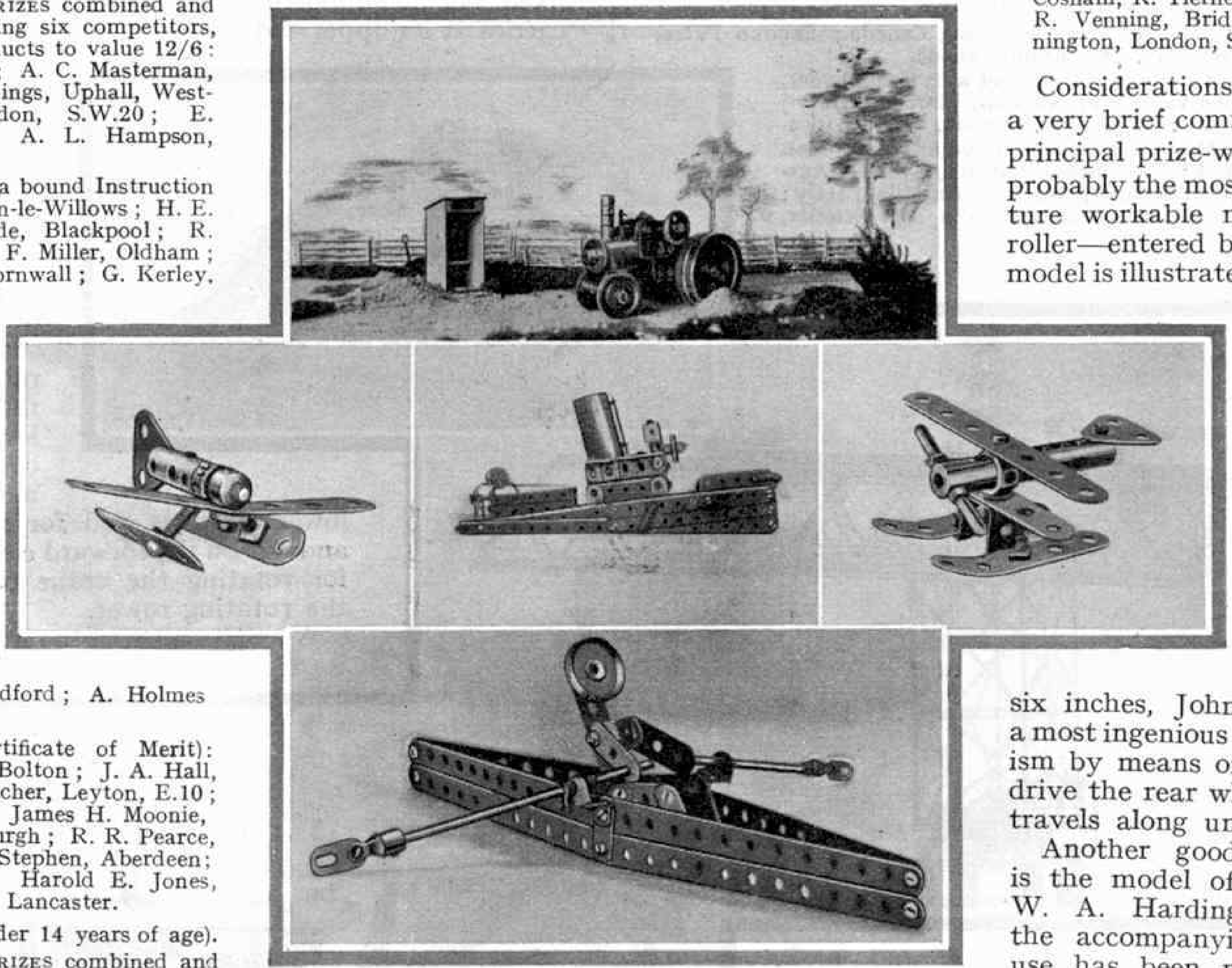
Section B (for competitors under 14 years of age).

First, Second, and Third Prizes combined and divided amongst the following six competitors, each receiving Meccano products to value 7/6 : T. L. Gardner, Trowbridge ; K. Davis, Littlehampton ; C. Roger Norton, Knighton Rise, Leicester ; J. Wood, Marino, Dublin ; D. B. Robin, Walworth, London, S.E.17 ; H. H. Lewis, Pontypool Road, Mon.

Six Prizes, each consisting of a copy of "Famous Trains" by C. J. Allen : T. Clark, Strabane, Co. Tyrone D. Winder, Liverpool ; R. Thomas, Cardiff; G. Stratton, Kingsbury, London, N.W.9 ; L. Clamp, Birmingham ; D. P. Young, Croydon.

Twelve Prizes, each consisting of a copy of the Meccano Engineers' Pocket Book : B. M. Rees, Cardiff ; P. L. Poole, Wolverley ; F. Hate, Erith ; R. Harkney, Braintree ; G. West, Steyning ; E. Batchelor, London, S.E.4 ; H. Mackie, Lockgelley, Fife ; B. P. Brewer, Ilford ; E. Morris, Beddau, near Pontypridd ; E. Meikle, Felixstowe ; L. Witcombe, Rossendale, Lancs. ; E. R. Davis, Littlehampton.

Specially Commended (Certificate of Merit) : A. Peacock, Soham, near Ely ; H. Scott, Bishop's Stortford ; G. B. Chapman, London, S.E.4 ; P. Bradley, London, N.W.9 ; J. Erskine, Paisley ; A. Henniker, Edinburgh ; M. McHattie, Westfield, near Bathgate ; F. G. Waterman, Ipswich ; J. Foulkes, Ilford ; C. Cadwallader, Twickenham ; Rodney Upcott, Woodbridge ; H. S. Fowler, London, S.E.10 ; F. W. Etherington, Plymouth ; W. A. Oliver, Dudley ; H. James, Harlington ; A. Bruce, Hawick ; L. A. Budd, Waterlooville, near Cosham, R. Tierney, Peckham, London, S.E.15 ; R. Venning, Bridgend ; Layton Mayne, Kennington, London, S.E.11.



Top : This life-like scene displays to advantage the ingenious model Steam Road Roller that secured a prize for A. M. Johnston. Middle Row : A Seaplane, by A. Ridings, W. A. Harding's Tug Boat, and another Seaplane, by S. Revell. Bottom : Skiff and Sculler, entered by A. L. Hampson.

Considerations of space will permit only a very brief commentary on a few of the principal prize-winning entries, of which probably the most interesting is the miniature workable model of a steam road roller—entered by A. M. Johnston. The model is illustrated on this page and it will be seen that not only has Johnston built a most realistic engine with a very few parts, but he has also succeeded in incorporating it in very realistic surroundings, which undoubtedly enhance the already excellent appearance of the model. Although the overall length of the engine does not exceed six inches, Johnston has fitted it with a most ingenious spring-operated mechanism by means of which it is possible to drive the rear wheels, so that the model travels along under its own power !

Another good entry in Section A is the model of a steam tug boat by W. A. Harding, which is shown in the accompanying illustration. Good use has been made of the few parts used. Seaplanes formed the subjects of the models submitted by S. Revell and A. E. Ridings, while an amusing model of a skiff and sculler formed the entry from A. L. Hampson.

T. L. Gardner, a prize-winner in Section B, achieved considerable success in building a realistic model of the famous locomotive the "Rocket." In this ingeniously-designed effort the boiler is formed from a Ship's Funnel, which is closed at one end with a 1" Pulley, and the familiar tall chimney of the "Rocket" is ably represented by Collars and Couplings mounted on a Threaded Rod that is passed at its lower end through the set-screw hole of the 1" Pulley.

First "Parts Required" Contest (Overseas)

As in the Home Section, no single Overseas competitor succeeded in compiling an all-correct list of parts required to build the Meccano model two-seater motor car that was illustrated on page 956 of the December, 1929 "*M.M.*," and the prizes were accordingly awarded to those competitors whose lists most nearly corresponded with the actual parts used in building the model. The following is the complete list of prize-winners :—

First Prize, Meccano products to value £1-1s. : J. F. Dennison, Otago, New Zealand; Second Prize, Meccano products to value 15/- : D. Atkinson, Nowra, South Coast, Australia ; Third Prize, Meccano products to value 10/6 : L. Osborne, Oakleigh, S.E.12, Australia.

Twelve Prizes, each consisting of a copy of the Meccano Engineer's Pocket Book : D. R. Heeramaneck, New Gamdevi, Bombay, India ; R. J. Ranikhetvala, Bombay, India ; R. Wallace, Durban, S. Africa ; C. D. Pengelley, Walderston, Jamaica, B.W.I. ; W. Fagg, Milton, Otago, New Zealand ; C. C. Stonyer, Kakahu, South Canterbury, New Zealand ; G. Davidson, Ashbury, Sydney, Australia ; W. Wainwright, Morningside, Auckland, New Zealand ; P. L. Bargellini, Florence, Italy ; H. E. Gairdiner, Troy, Canada ; C. J. McCain, Leichhardt, Sydney, Australia ; M. Frankel, Muizenberg, Cape Town, S. Africa.

The actual parts used in the construction of the miniature Motor Car are as follows:– 2 of No. 1a ; 1 of No. 2a ; 8 of No. 4 ; 1 of No. 6 ; 4 of No. 6a ; 2 of No. 9 ; 2 of No. 9b ; 2 of No. 9c ; 1 of No. 9d ; 3 of No. 10 ; 2 of No. 11 ; 8 of No. 12 ; 1 of No. 12b ; 1 of No. 16 ; 1 of No. 16b ; 5 of No. 21 ; 1 of No. 22 ; 2 of No. 29 ; 67 of No. 37 ; 2 of No. 37a ; 4 of No. 38 ; 5" of No. 40 ; 1 of No. 48 ; 3 of No. 48a ; 4 of No. 59 ; 1 of No. 70 ; 3 of No. 72 ; 1 of No. 77 ; 2 of No. 90a ; 2 of No. 103d ; 2 of No. 103e ; 2 of No. 103g ; 1 of No. 111c ; 1 of No. 115 ; 2 of No. 126a ; 1 of No. 136 ; 5 of No. 142d ; 2 of No. 147b.

Second "Mechanism" Contest (Overseas)

Below will be found the names of prize-winners in the "Overseas" Section of this contest. The results in the Home Section appeared in the "*M.M.*" for May. It will be remembered that the primary object of this contest was to test readers' skill in designing braking appliances suitable for retarding moving vehicles, such as trains, wagons, motor cars, etc.

A large quantity of interesting entries was received but as the space available will not permit illustrating any of them this month, it is hoped to be able to include one or two of the more outstanding models in the "Suggestions Section" of future issues of the "*M.M.*"

First Prize, Meccano products to value £1-1s. : Marcus D'Lima, Bombay, India. Second Prize, Meccano products to value 15/- : Owen Llewelyn, Sydney, N.S.W., Australia ; Third Prize, Meccano products to value 10/6 : N. Lupton, Bloemfontein, S. Africa.

Twelve Prizes, each consisting of a Meccano Engineers' Pocket Book : John A. Rodriguez; Montreal, Canada ; J. M. Kruger, Johannesburg, S. Africa ; C. E. Bulkley, Pretoria, S. Africa ; J. W. Buckell, Montreal, Canada ; W. M. Flanderka, Bambalapitija, Colombo, Ceylon ; T. C. Brook, Natal, S. Africa ; Herbert Curry, Windsor, Canada ; J. Morgan, London, Canada ; P. Garner, Melbourne, Australia ; T. Merlyn, Christchurch, New Zealand ; S. Chadwick, Brisbane, Australia ; O. Jones, Toronto, Canada.

The First Prize was awarded for a cleverly-designed demonstration model of a combined vacuum and hand brake, of the type used on Indian railway wagons.

Entirely New Model-Building Contest: "Engineering of the Future"

HAVE YOU ENTERED THIS INTERESTING CONTEST?

LAST month's *"M.M."* contained the announcement of an entirely new type of model-building competition, entitled "Engineering of the Future," and as there is still plenty of time before the closing dates for Meccano boys to construct and enter models, we are repeating full particulars of the contest, so that any readers who did not see the previous announcement may have a chance to compete for the splendid prizes offered.

The Home Sections close on 31st July, 1930, but the Overseas Section will remain open until 30th September. Intending competitors should set to work immediately on their models, and send in their entries as soon as possible.

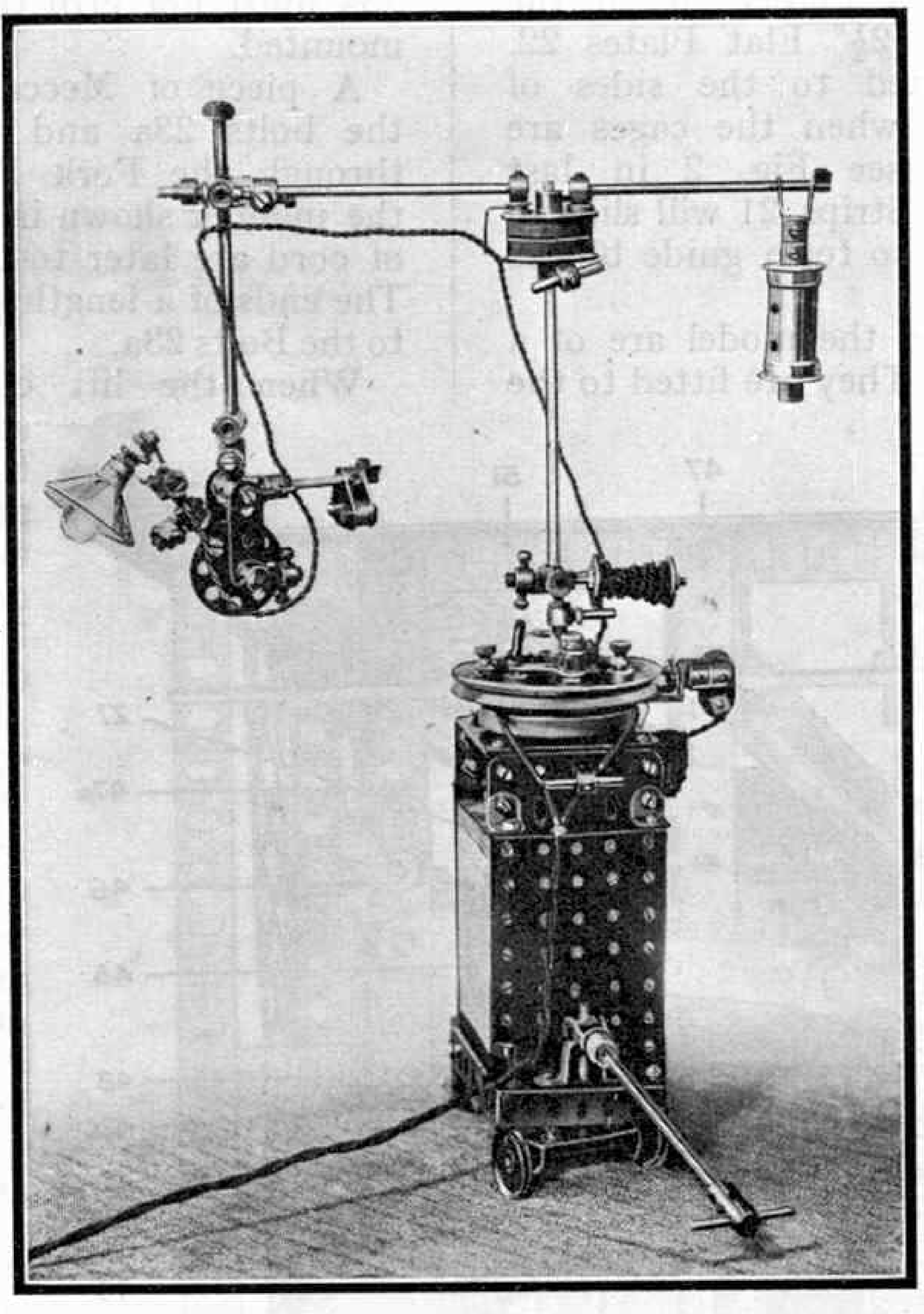
Wonders of the Twenty-first Century

The competition has been organised with the object of ascertaining how Meccano boys visualize the engineering world of, say, a hundred years hence. The numerous splendid prizes will be awarded to the builders of the most ingenious and practical models representing machines, aeroplanes, locomotives, or any other engineering contrivances which, in the opinion of the builders, will be commonplace to the engineers of 2,000 A.D. or later.

While the progress made in engineering during the past century has been very great there is undoubtedly scope for still further extension, and it seems very likely that, assuming the present rate of invention continues, the year 2,000 A.D. will see a vastly different civilisation to that which we know to-day. Although it is, of course, impossible to say what new principles will be developed by the engineers of the future, it is probable that the results will be quite as startling to those who live to see them as the mechanical and electrical methods of to-day would be to our ancestors.

No doubt aeroplanes will be so much improved that a flight round the world will be less exciting than a railway journey is to-day. Transport on land will probably be carried out by machines that will differ greatly from the locomotives, motor cars, and omnibuses which we know to-day. Mono-rail cars capable of enormous speeds may take the place of our present two-rail system.

AN AID TO MODEL-BUILDING



This unique Meccano model of a Portable Electric Lamp is capable of throwing a beam of light at any angle, and consequently it is useful for lighting dark corners of intricate models during construction. It was devised and built by D. R. Heeramaneck, of Bombay, and secured a prize in a recent Model-building Contest.

How to Enter the Contest

The Contest is open to every owner of a Meccano Outfit. There are no entrance fees to be paid or forms to be filled in. Competitors should give their imagination full rein and try to visualize engineering wonders as they will appear to the boys of the next century.

Entries will be divided into three sections: Section A, for readers residing in the British Isles and over 14 years of age; Section B, for readers residing in the British Isles and under 14 years of age; and Section C, for Overseas readers of all ages.

The prizes in Sections A and C are as follows: First, cheque for two guineas; Second, cheque for one guinea; Third, cheque for half-a-guinea. Twelve Prizes, each of Meccano goods to value 5/-. Twelve Meccano Engineers' Pocket Books.

The Prizes in Section B are as follows: First, Meccano goods to value two guineas; Second, Meccano goods to value one guinea; Third, Meccano goods to value 10/6. Six Prizes, each of Meccano goods to value 5/-. Twelve Meccano Engineers' Pocket Books.

Entries should be addressed: "Engineering of the Future" Contest, Meccano Ltd., Binns Road, Liverpool.

Actual models must not be sent. It is only necessary to submit either clear photographs, or, if this is not possible, good drawings of models, together with a brief but concise explanation of any structural or mechanical features that are not easily apparent from the photos or drawings.

Warehouse with Elevators

Completion of Constructional Details

In this article we conclude the detailed instructions for building the Meccano model Warehouse with Elevators. Last month we described the assembly of the structural portion of the model, comprising the Frame, Cage Guides, Platforms, and Roof. This month we deal with the construction of the Winding Gear, Cages, Safety Devices, and other mechanical features, and with the assembly of these parts in the framework of the Warehouse.

Construction of Cages and Safety Devices

One of the two similar cages is shown in Fig. 6. It consists of two 2½″ × 3½″ Flanged Plates 20 to the flanges of which are bolted 2½″ × 2½″ Flat Plates 22. Single Bent Strips 21 are bolted to the sides of each cage in such positions that when the cages are placed between the guides 7 (see Fig. 2 in last month's article) the Single Bent Strips 21 will slide in the channels of the guides and so form guide blocks for the cages.

The safety devices employed in the model are of a simple yet very interesting type. They are fitted to the top of each cage as shown in Fig. 6 and each is constructed as follows. A Coupling 25 is secured to the roof of the cage by means of a ⅜″ Bolt that is locked in position by a nut. In its upper transverse hole this Coupling carries a 1½″ Rod that is secured centrally in the Coupling. The Rod carries two Fork Pieces 24 that are secured one on each side of the Coupling. Two Pawls 23 are held pivotally on bolts lock-nutted in the Fork Pieces as shown, and each Pawl has a ⅜″ Bolt 23a instead of the usual grub screw, the bolt being held firmly by means of a nut screwed against the boss of the Pawl. The Bolts 23a must not grip the pivots on which the Pawls are mounted.

A piece of Meccano cord is attached to each of the bolts 23a and the ends of the cord are brought through the Fork Pieces behind the Pawl bosses in the manner shown in the photographs. (The two pieces of cord are later to be attached to the lifting cord 27). The ends of a length of Spring Cord 26 are also attached to the Bolts 23a.

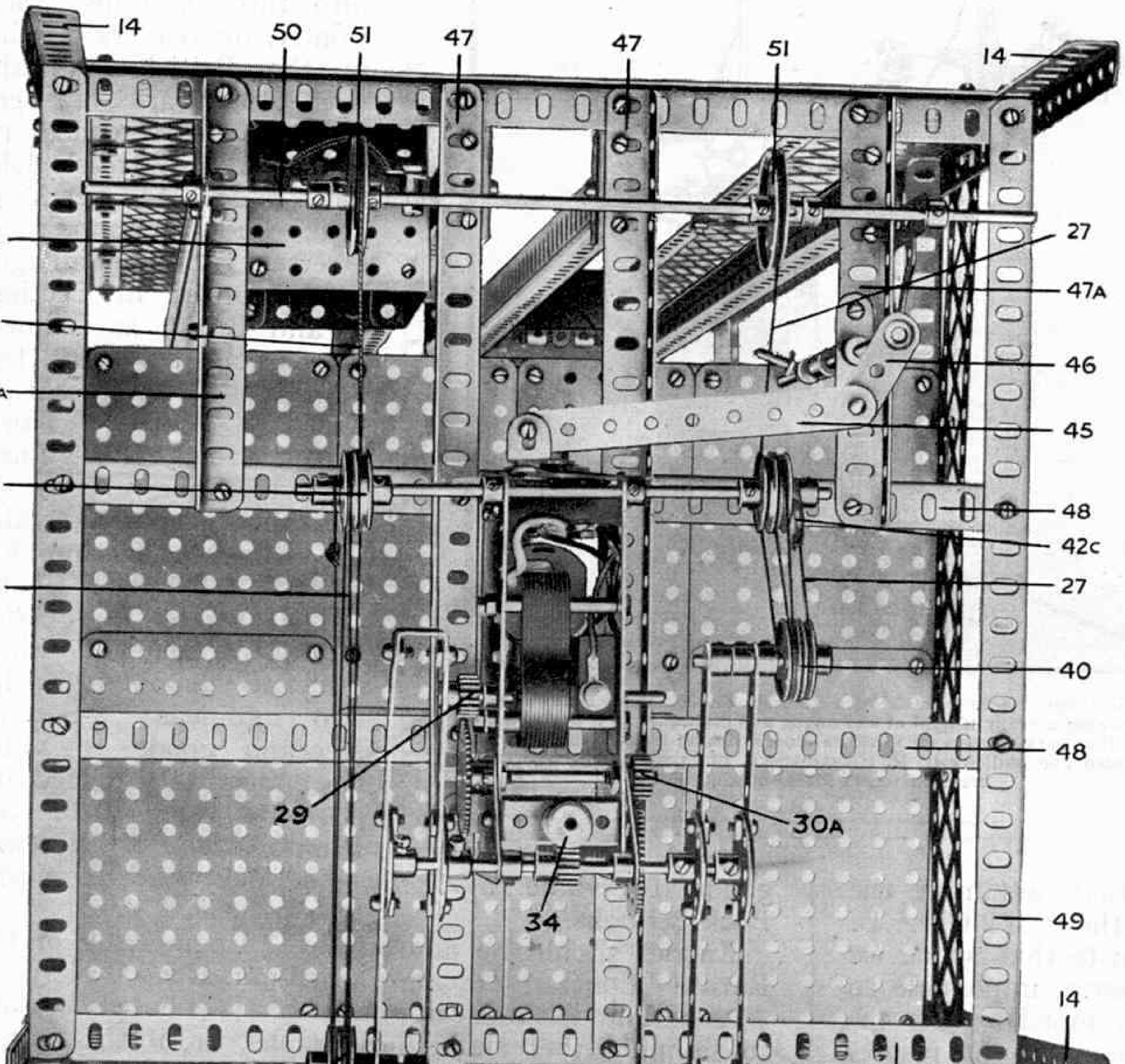


Fig. 5. Plan view of the Top Floor of the Warehouse, showing the arrangement of the mechanism.

When the lift cord 27 is in tension—that is, as soon as the cage is raised from the ground—the Pawls 23 are rotated slightly on their pivots and their projecting ends pulled downward clear of the lift guides. This movement bends the Spring Cord 26 so that one side of it is in tension. Now should the cord 27 break or fail for any reason the Pawls are no longer held down and owing to the action of the Spring Cord, which tends always to straighten out, the ends of the Pawls rise and engage with the elongated holes of the guides 7. The cage is consequently locked safely in position in the shaft and cannot be moved until the Pawls are pulled downward and clear of the guides.

This most interesting feature of the model is closely allied in principle to the safety device usually employed on the actual lift.

The Operating Mechanism

The mechanism incorporated in the model for lifting and lowering the two cages is of special interest as it enables the model to be worked for an indefinite period without attention. It is entirely automatic in action, and the arrangement is such that one cage is raised while the other is being lowered.

In operation, as soon as the Electric Motor is set in motion one of the cages ascends and the other descends until both cages have reached the top or bottom positions of their respective guides, when they come to rest as though to allow for loading and unloading. Then after a short pause the upper cage descends while the lower ascends, and the process is repeated each time the limit of travel is reached.

The 6-volt Meccano Motor is secured in position by bolting its flanges to the transverse Angle Girders 47 (Fig. 5). The drive is taken from the Motor armature via a ½" Pinion 29, the 57-teeth Gear Wheel 30, and a ½" Pinion 30a on the opposite end of the Rod carrying the Gear 30 that meshes with another 57-teeth Gear Wheel 31 on a 2" Rod (see also Fig. 7).

On the latter Rod is a Worm 32 meshing with a ½" Pinion secured to a vertical 3" Rod 33, which is journalled in bearings consisting of a 2½" Strip 43 bolted across the Girders 47 beneath the Motor (Figs. 5 and 7) and a 1½"×½" Double Angle Strip 33a secured between the Motor side plates. The Rod 33 carries at its upper extremity a second Worm 34 meshing with a ½" Pinion on the 3½" Rod 35.

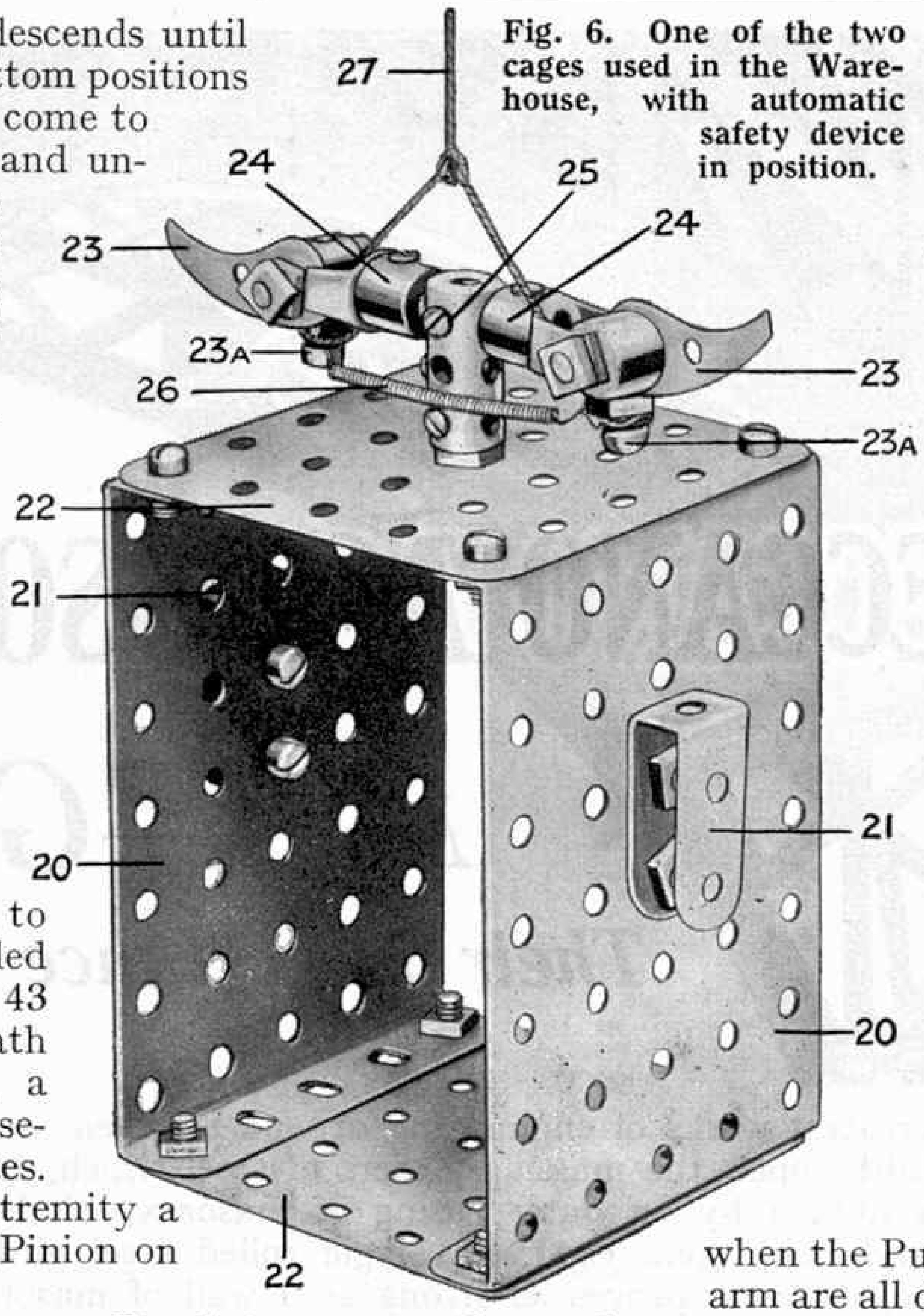


Fig. 6. One of the two cages used in the Warehouse, with automatic safety device in position.

This Rod 35 is journalled in Corner Brackets, as shown, and carries at its ends the device whereby the automatic reversing hoist motion is obtained. It will be seen that it consists essentially of two rotating arms each of which is built up from 5½" Strips, secured rigidly to the Rod 35 by means of Bush Wheels 38, and a system of 1" loose Pulleys 40 and 42. The Pulleys 40 are free to run on a 2" Rod 39 journalled in each arm and the Pulleys 42 are mounted on a 4½" Rod attached to the Motor. A Washer is placed between the Pulleys to minimise friction and allow freedom of movement.

The spindle of the Pulleys 40 follows the circular path traced out by the end of the arm, while the spindle of the Pulleys 42 is fixed. The cord 27, which is attached to the cage, passes over the Pulleys 51 at the top of the lift shaft. It is then led under one of the 1" loose Pulleys 42, round one of the Pulleys 40, back to the remaining Pulley 42 and thence to the second 1" Pulley 40. After passing round the latter, it is secured to the Flat Bracket 42c.

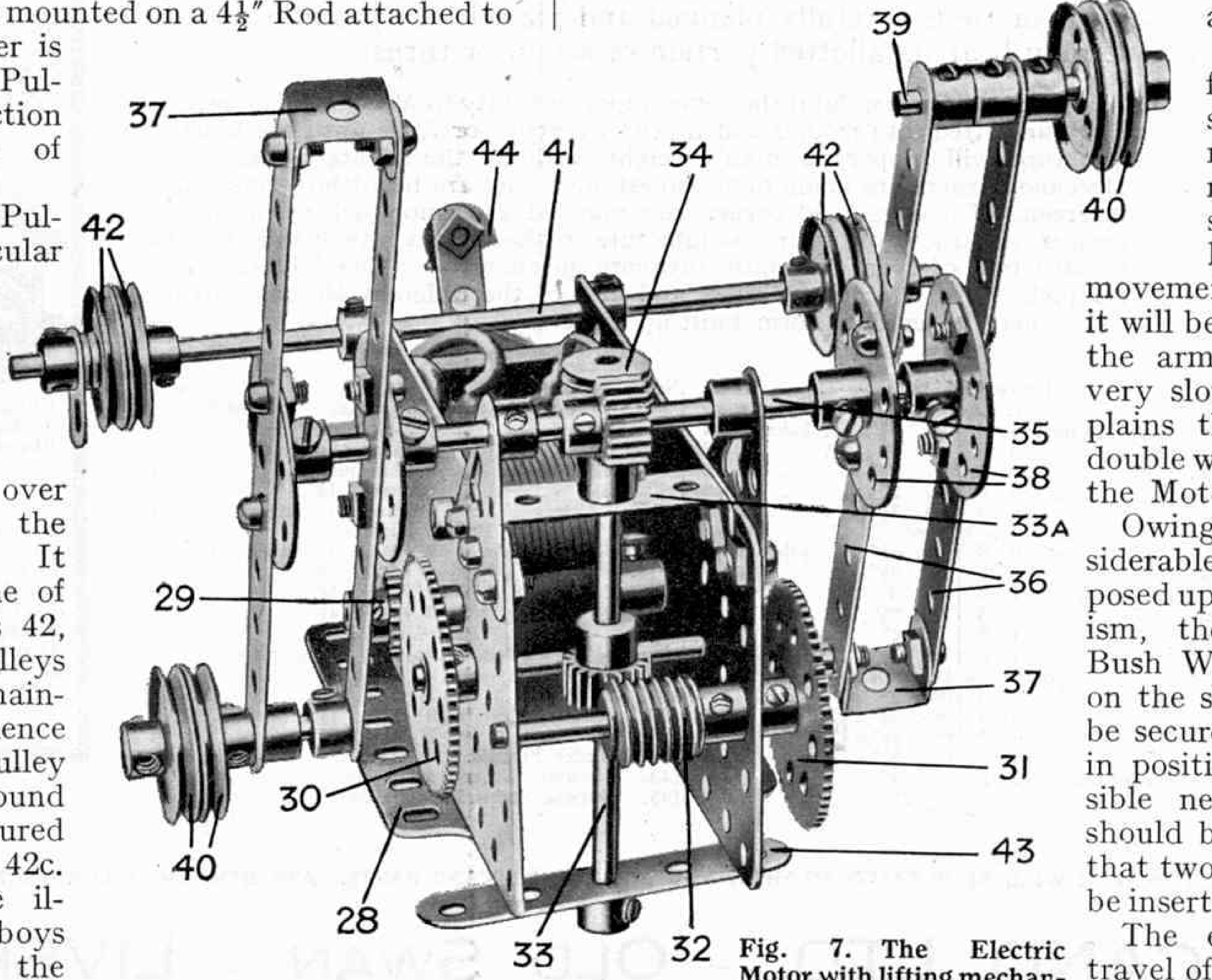


Fig. 7. The Electric Motor with lifting mechanism mounted in place.

On examining the illustration Meccano boys will observe that the system is similar in effect to the two-sheave pulley block, in which the free end of the cord, where the power is applied, moves through four inches for every inch the load is raised. In the model, however, the load (i.e., the lift cage) is attached to the cord at a point corresponding to the free end in the ordinary pulley block, and the power is applied to the movable pulley block. Consequently the reverse effect is obtained, the lift cage moving through four inches for every inch of movement of the Pulleys 40 relative to the Pulleys 42.

When the Pulleys 40 advance towards the Pulleys 42, the hoisting rope is paid out, but as the distance between the two sets of Pulleys decreases, the relative motion between them also decreases, with the result that the movement of the cage becomes gradually slower until finally, when the Pulleys 40 and 42 and the moving arm are all directly in line, all movement of the cord ceases. At this point the cage is at rest at the ground floor.

The rotating arm continuing its motion, now commences to withdraw the Pulleys 40, with the result that the hoisting cord is hauled in and the cage begins to rise, gradually gathering speed as the increasing angle of the rotating arm increases the relative movement between the Pulleys 40 and 42.

In view of the fact that a slight movement of the rotating arm results in a greatly magnified movement of the cages, it will be apparent that the arms must rotate very slowly. This explains the use of the double worm drive from the Motor.

Owing to the considerable strains imposed upon the mechanism, the Pinion and Bush Wheels mounted on the shaft 35 should be secured very rigidly in position and if possible new style parts should be employed so that two set-screws can be inserted in each boss.

The extent of the travel of the cages may

(Continued on page 580)

MECCANO ACCESSORY PARTS

No. 1.—*Girders*

Their Importance in Engineering

The greatest works of engineering depend for their strength and durability upon the massive girders of steel which, though sometimes hidden by an outer casing of masonry, bind them together and hold them rigid. A single rolled steel girder, if properly constructed, proves as strong as a wall of masonry.

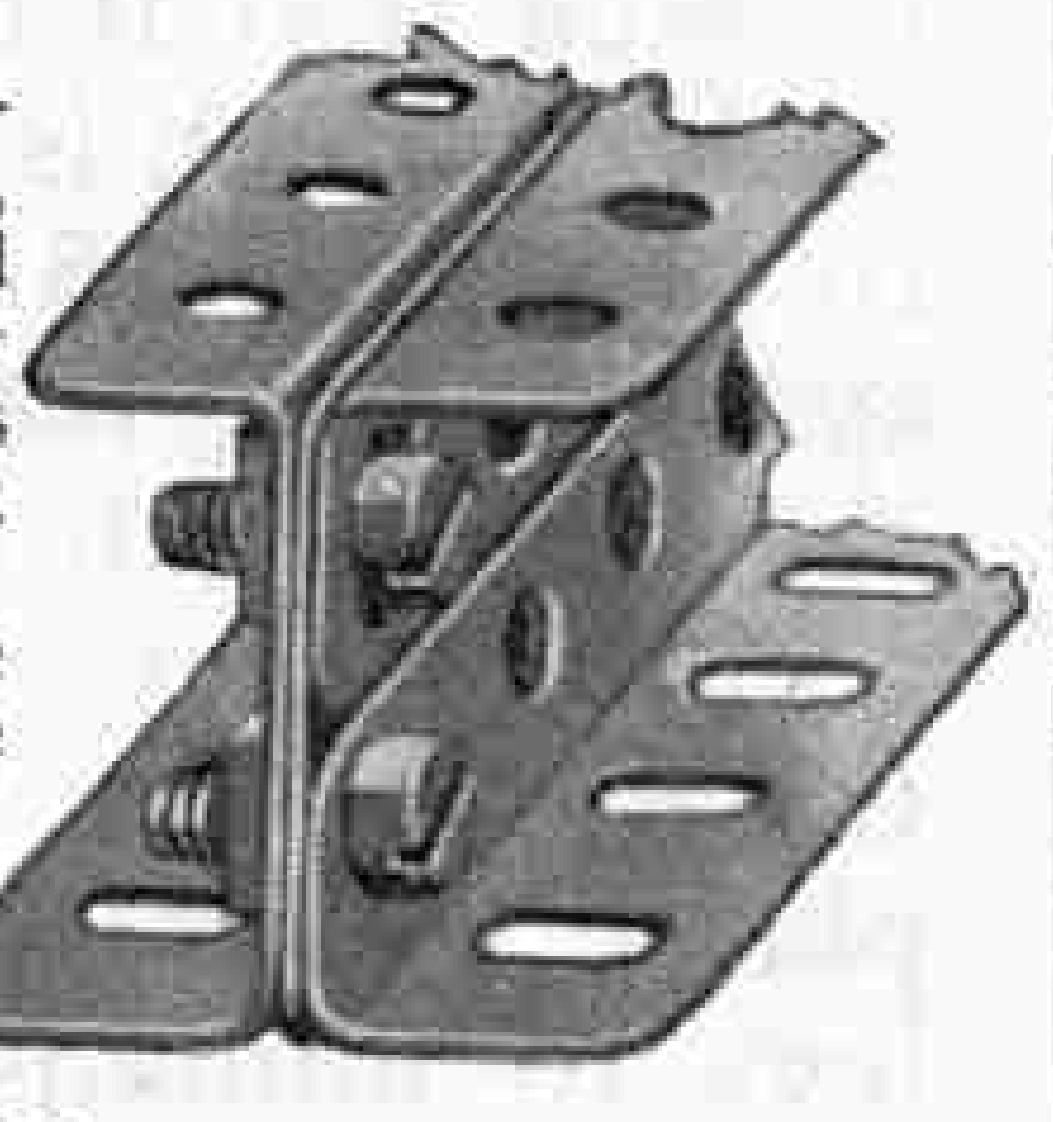
The Forth Bridge, a steel highway 1½ miles in length, suspended high above the Forth; the Eiffel Tower, extending almost to the height of a mountain; the Woolworth Building, the tallest skyscraper in New York—these are three of the world's greatest structures that stand like monuments to man's constructive skill. The last named disguises its steel skeleton in a cloak of masonry, but the others tower into the sky like huge Meccano models. It is plain to see how even the smallest strut or tie is carefully planned and placed into position so that it may bear its allotted portion of strain or thrust.

Meccano Girders fulfil the same important duty in Meccano engineering. They are fitted into models and braced by Strips or Rods until the finished structure will support a man's weight, without the slightest disruption. Meccano Girders are made of the finest steel, and are beautifully enamelled in green. The edges and corners are rounded and smoothed off, while the perfect accuracy of their manufacture makes them invaluable in the construction of even the most intricate mechanisms. The following is a complete list of Meccano Girders and also of the different Meccano Strips, which may be used to form built-up girders.

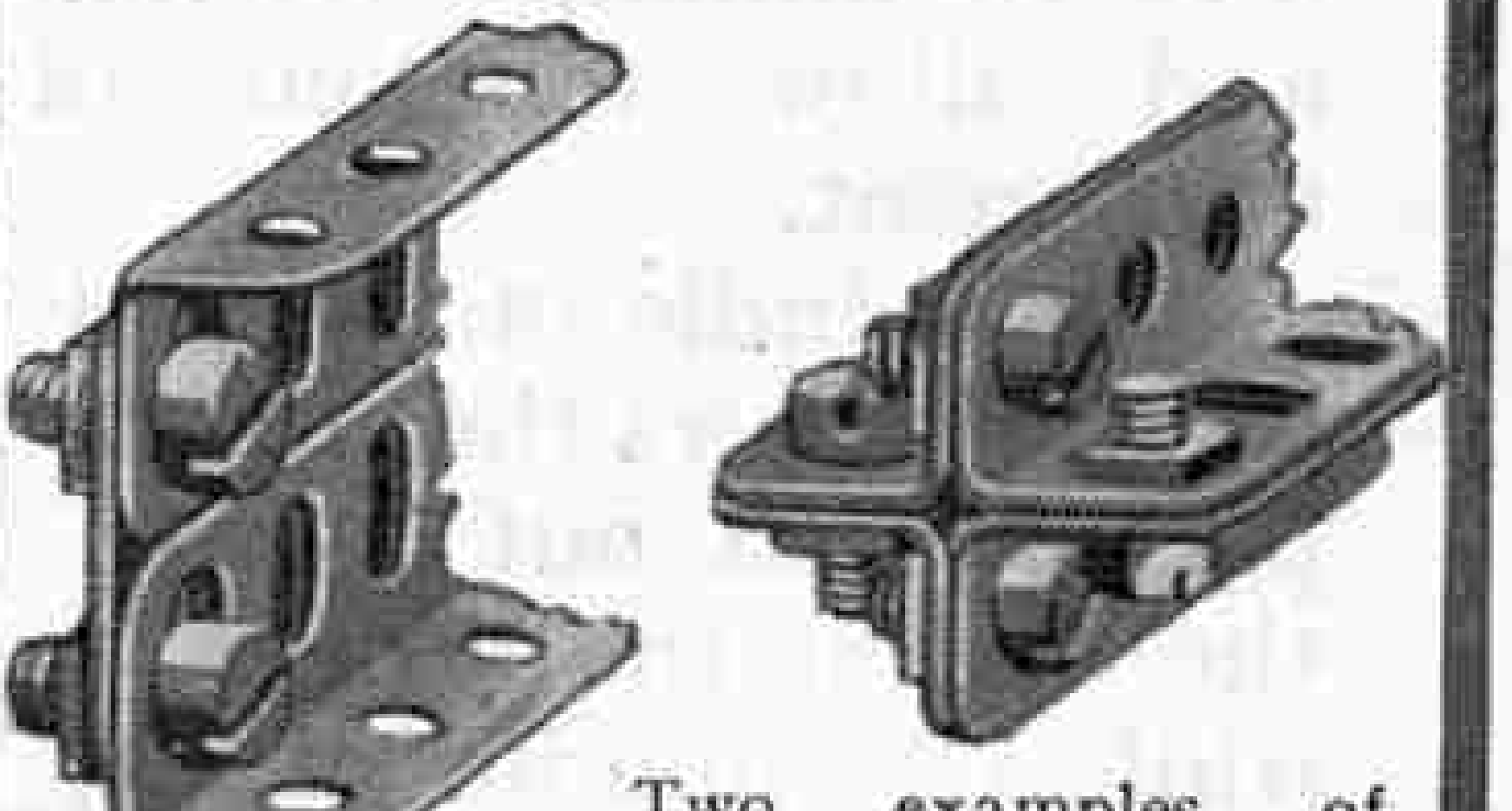
No.			s.	d.	No.			s.	d.
	Perforated Strips.								
1	12½" ...	½ doz.	1	0	3.	3½" ...	½ doz.	0	4
1a.	9½" ...	„	0	9	4.	3" ...	„	0	3
1b.	7½" ...	„	0	8	5.	2½" ...	„	0	3
2.	5½" ...	„	0	6	6.	2" ...	„	0	3
2a.	4½" ...	„	0	5	6a.	1½" ...	„	0	3
	Angle Girders.								
7.	24½" ...	each	0	8	9a.	4½" ...	½ doz.	0	10
7a.	18½" ...	„	0	6	9b.	3½" ...	„	0	8
8.	12½" ...	½ doz.	1	9	9c.	3" ...	„	0	8
8a.	9½" ...	„	1	3	9d.	2½" ...	„	0	7
8b.	7½" ...	„	1	2	9e.	2" ...	„	0	6
9.	5½" ...	„	1	0	9f.	1½" ...	„	0	6
	Double Angle Strips.								
46.	2½"×1"	½ doz.	0	6	48a.	2½"×½"	½ doz.	0	5
47.	2½"×1½"	„	0	9	48b.	3½"×½"	„	0	6
47a.	3" ×1½"	„	0	10	48c.	4½"×½"	„	0	9
48.	1½"×½"	„	0	4	48d.	5½"×½"	„	0	9
55.	Perforated Strips, slotted, 5½" ...						each	0	2
55a.	„ „ „ 2" ...						„	0	1

No.			s.	d.	No.			s.	d
89.	5½" Curved Strips, 10" radius ...						each	0	2
89a.	3" „ „ cranked, 1¾", radius, 4 to circle						„	0	2
90.	2½" „ „ 2⅜" radius ...						„	0	1
90a.	2½" „ „ cranked, 1¾" radius, 4 to circle						„	0	1
	Braced Girders.								
97.	3½" long	½ doz.	0	9	99a.	9½" long	½ doz.	2	0
97a.	3" „	„	0	8	99b.	7½" „	„	2	0
98.	2½" „	„	0	8	100.	5½" „	„	1	0
99.	12½" „	„	2	6	100a.	4½" „	„	0	10
	Flat Girders.								
103.	5½" long	½ doz.	0	10	103e.	3" long	½ doz.	0	6
103a.	9½" „	„	1	2	103f.	2½" „	„	0	5
103b.	12½" „	„	1	3	103g.	2" „	„	0	4
103c.	4½" „	„	0	9	103h.	1½" „	„	0	4
103d.	3½" „	„	0	7	103k.	7½" „	„	1	0
113.	Girder Frames...						each	0	3
143.	Circular Girders, 5½" diam. ...						„	1	0
145.	Circular Strips, 7½" diam. over all ...						„	0	9

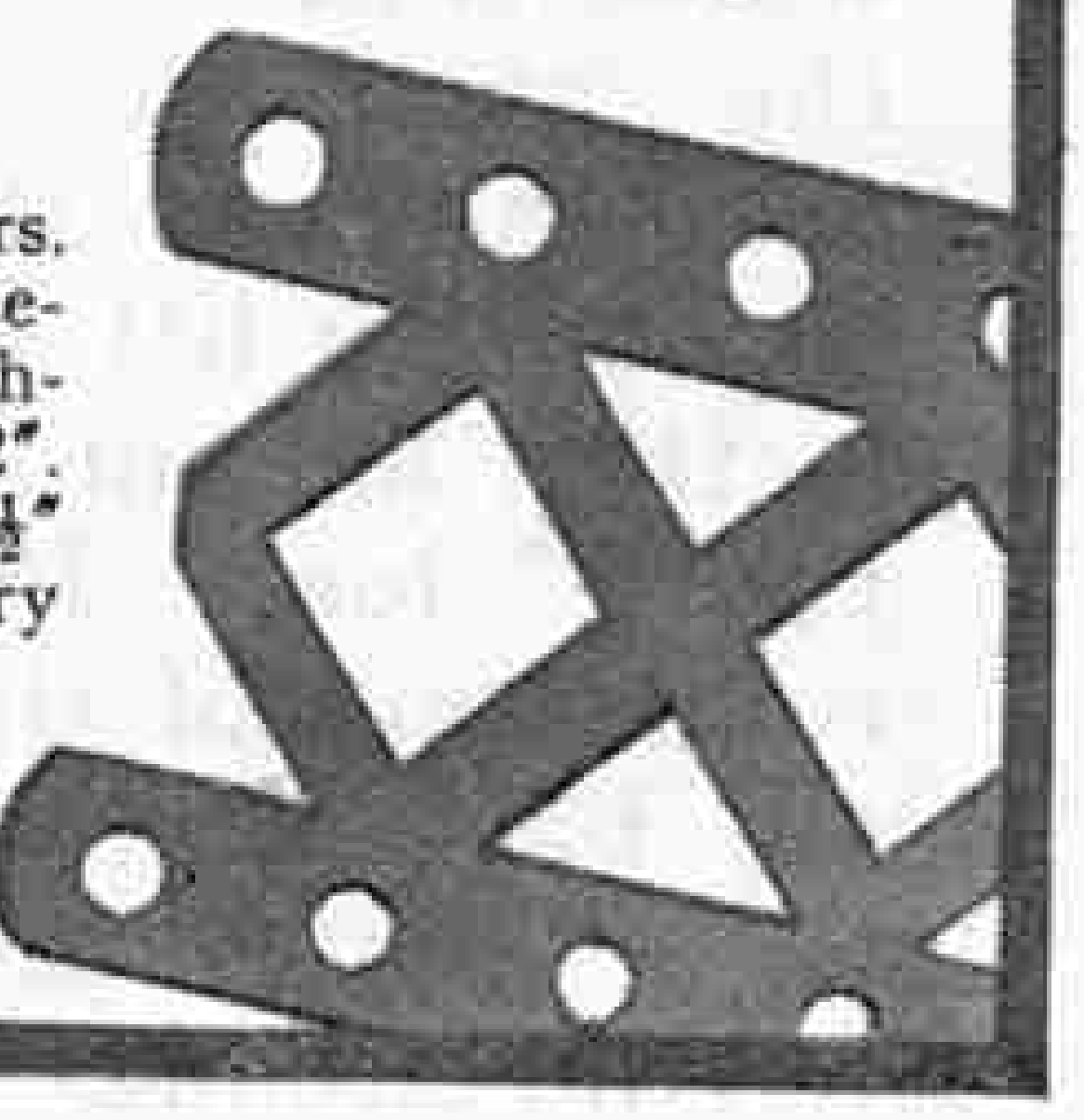
Angle Girders ("L" section, ½" × ½") in 12 lengths, ranging from 1½" to 24½".



Meccano built-up Steel Joist, constructed from four Angle Girders and one Flat Girder. The complete unit is massive and of very great strength.



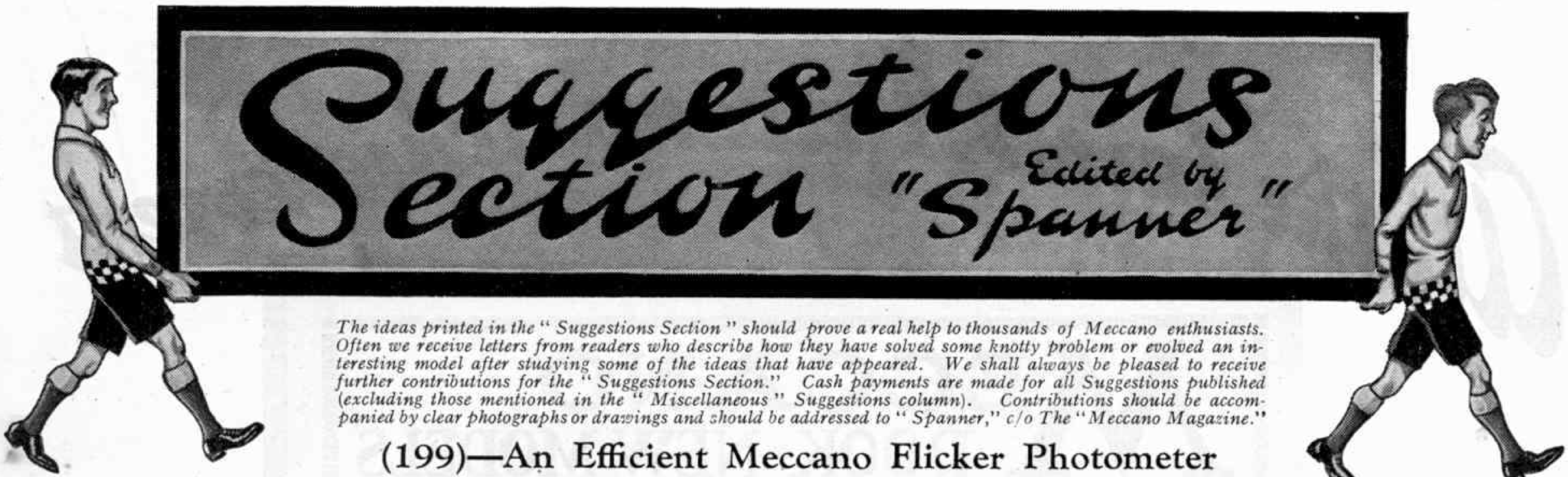
Two examples of Meccano construction; Channel Section (left) and Cross Section Girders. The latter consists of a pair of "T" girders butted together.



Braced Girders. Stout latticework throughout. Width 2". In 8 lengths, 2½" to 12½". Very ornamental and of great utility.

YOUR DEALER WILL BE PLEASED TO SHOW YOU ALL THE MECCANO PARTS. ASK HIM FOR A COMPLETE PRICE LIST.

MECCANO LTD. - OLD SWAN - LIVERPOOL



Suggestions Section

Edited by "Spanner"

The ideas printed in the " Suggestions Section " should prove a real help to thousands of Meccano enthusiasts. Often we receive letters from readers who describe how they have solved some knotty problem or evolved an interesting model after studying some of the ideas that have appeared. We shall always be pleased to receive further contributions for the " Suggestions Section." Cash payments are made for all Suggestions published (excluding those mentioned in the " Miscellaneous " Suggestions column). Contributions should be accompanied by clear photographs or drawings and should be addressed to " Spanner," c/o The "Meccano Magazine."

(199)—An Efficient Meccano Flicker Photometer

(*S. B. Anderton, Birchfield, Birmingham*)

It is practically impossible, of course, to gauge by eye the intensity of even a weak source of light, but with the aid of an instrument known as a photometer the luminosity of almost any light can be accurately measured by comparison with a given standard.

The simplest form of this instrument is that known as the Bunsen, or " grease-spot," photometer, which consists essentially of a screen of moderately opaque paper having in its centre a spot of grease. The light to be measured is directed upon one side of the screen and the standard light upon the other. The distances of the lights are then adjusted until the luminosity of the grease spot is exactly the same as that of the screen. This result being achieved, the distance of each light from the screen is squared, and the relative power of the two lights thus ascertained. For example, if a small electric bulb must be four times as far away from the spot as a light of one standard candle power in order to produce the balance of light, then it will have a candle power of 16.

Another form of photometer that is perhaps more accurate and can be used not only for very powerful lights, but for lights of varying colours, is the flicker photometer, and Fig. 199 shows a Meccano reproduction of one of these instruments. The Meccano model is simple to build and operate, and produces remarkably accurate results.

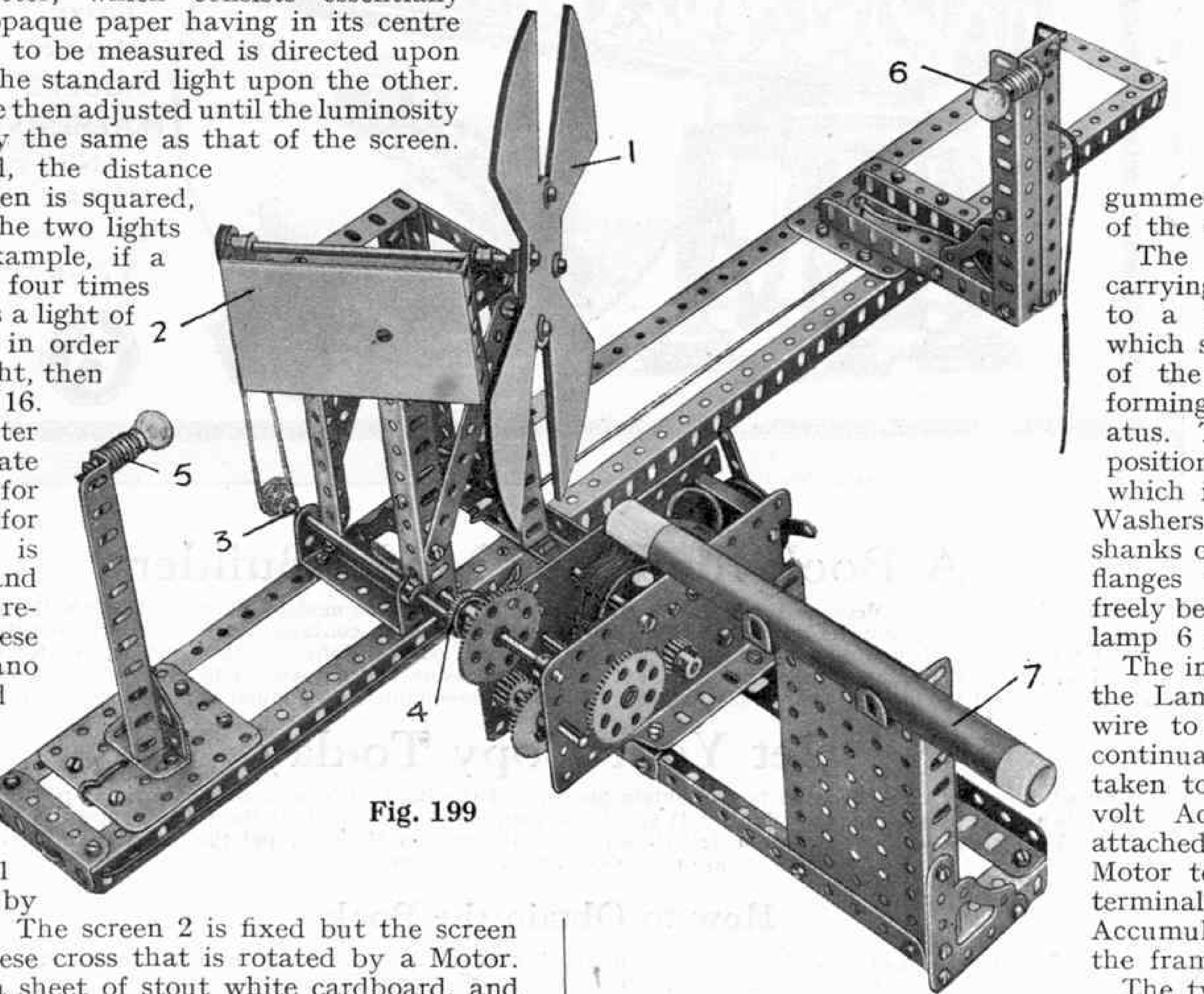


Fig. 199

It will be seen that the apparatus consists essentially of two screens 1 and 2 that are illuminated by the lights to be compared. The screen 2 is fixed but the screen 1 takes the form of a maltese cross that is rotated by a Motor. The cross is cut out from a sheet of stout white cardboard, and is secured to a Bush Wheel on a Rod that is journalled in a 3½" × ½" Double Angle Strip bolted to the top of a vertical frame. The Double Angle Strip is arranged to make an angle of 45 degrees with the longitudinal axis of the model.

The screen 2 consists of a 3½" × 2½" Flanged Plate covered with a piece of cardboard of the same texture as that employed in the maltese cross and is secured in such a position that its face is at right angles to the cross. The latter is driven from a countershaft 3 by means of an endless belt formed from a length of Spring Cord. The countershaft is driven in turn by a Spring Cord belt that passes over a ½" fast Pulley on the countershaft and over a similar Pulley 4 on the Motor.

The eye piece 7 is composed of a short length of ½" diameter brass tubing, and is coated inside with lamp black. If brass tubing is not easily obtainable, a substitute may be made by wrapping a piece of gummed paper round a former of the right size.

The 5½" Angle Girder carrying the Lamp 5 is secured to a 2½" × 2½" Flat Plate, which slides upon the flanges of the 24½" Angle Girders forming the base of the apparatus. The Plate is retained in position by a similar Plate to which it is secured by bolts, Washers being placed on the shanks of the bolts so that the flanges of the Girders slide freely between the Plates. The lamp 6 is mounted similarly.

The insulated 6 B.A. Bolt of the Lamp 5 is connected by wire to the Lamp 6 and a continuation of this wire is taken to one terminal of a 6-volt Accumulator, which is attached also to one of the Motor terminals. The other terminals of the Motor and Accumulator are connected to the framework.

The two screens are each at 45 degrees to the line of sight. Hence as the maltese cross rotates, the eye sees alternate patches of first one screen and then the other. When the screens are illuminated differently by their respective lamps, a flickering effect is seen, but if the distance of each lamp from its screen is adjusted until the flicker is absent, then the screens are illuminated to the same degree and the ratio of the powers of the two lamps may be determined from the squares of their respective distances from the line of sight.

Miscellaneous Suggestions

(M.90). Improved Pendulum.—D. Nicholson, Sheffield, suggests a vernier adjustment for a Meccano clock pendulum, formed from an 11½" Screwed Rod and Threaded Boss, to facilitate regulation of the mechanism.

(M.91). A Neat Crankshaft.—Fig. M.90 illustrates a novel method, proposed by O. Neal Smith (London), of building up small crankshafts of one or more throws (that shown is a triple-throw two-bearing crankshaft). The crank webs are constructed by screwing the head of a grubscrew into one of the holes of a Collar so that one half of its shank is left projecting beyond the surface of the Collar. A second Collar is then screwed on to the shank of the grubscrew and tightened up so that both Collars are secured firmly. The centre web portion consists of two Collars secured by grubscrews to a " spider " (removed from a Swivel Bearing) so that they are at right angles to one another. Grubscrews inserted in the remaining tapped holes of the various Collars serve to secure in place the crankpins and journals (straight portions) of the crankshaft. The connecting rods consist of Screwed Rods that are partially inserted in the grubscrew holes of Collars that turn freely on the crankpins.

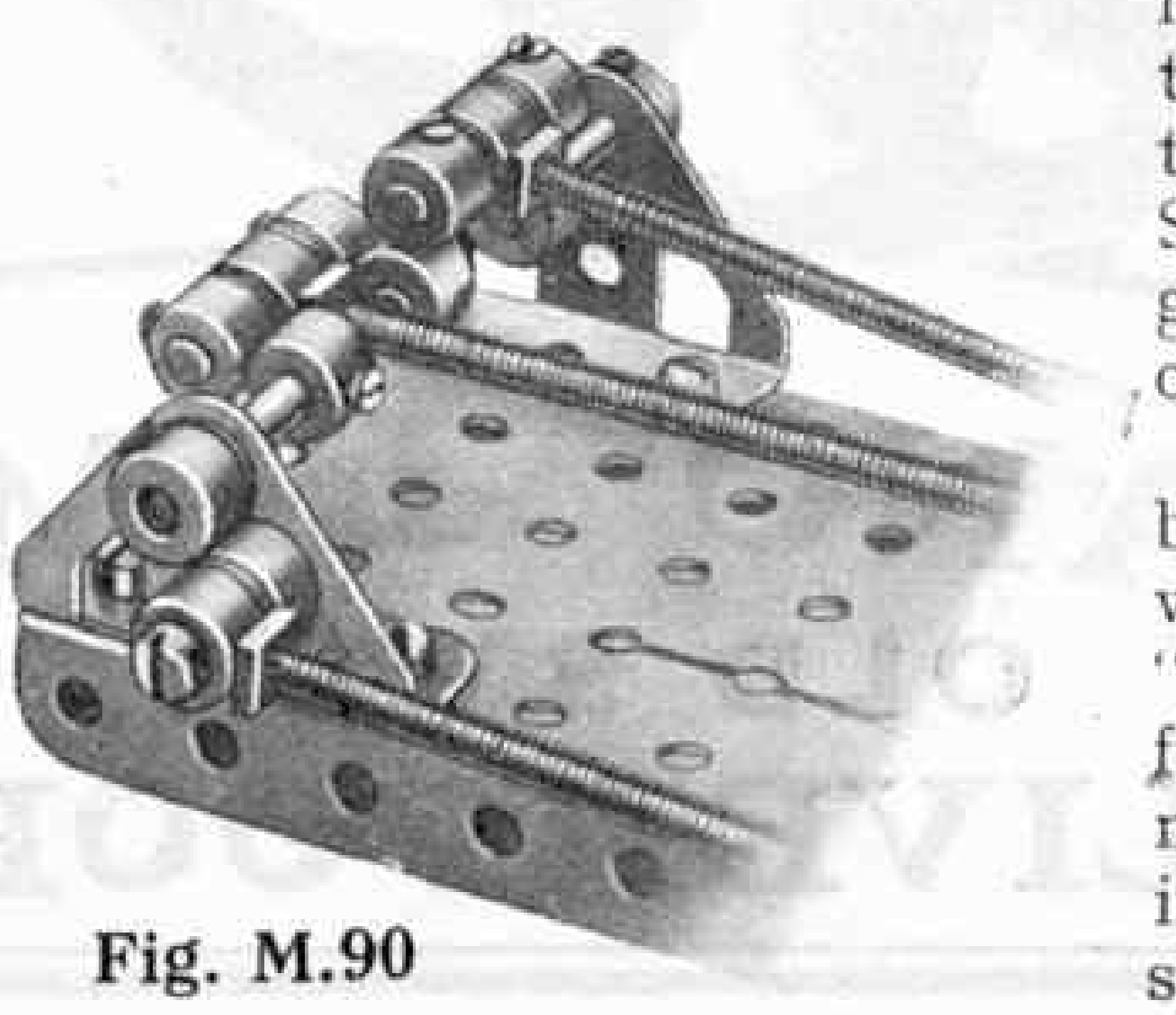


Fig. M.90

(M.92). A " Heavy-duty " Bearing.—A type of bearing designed by S. Garrett (Lincoln) for use with heavy loads, may prove of interest to some "*M.M.*" readers. The bearing proper is formed from a " spider " taken from a Universal Coupling, mounted inside a Double Bent Strip and secured in place by bolts, Washers serving to space the spider centrally in the Double Bent Strip.

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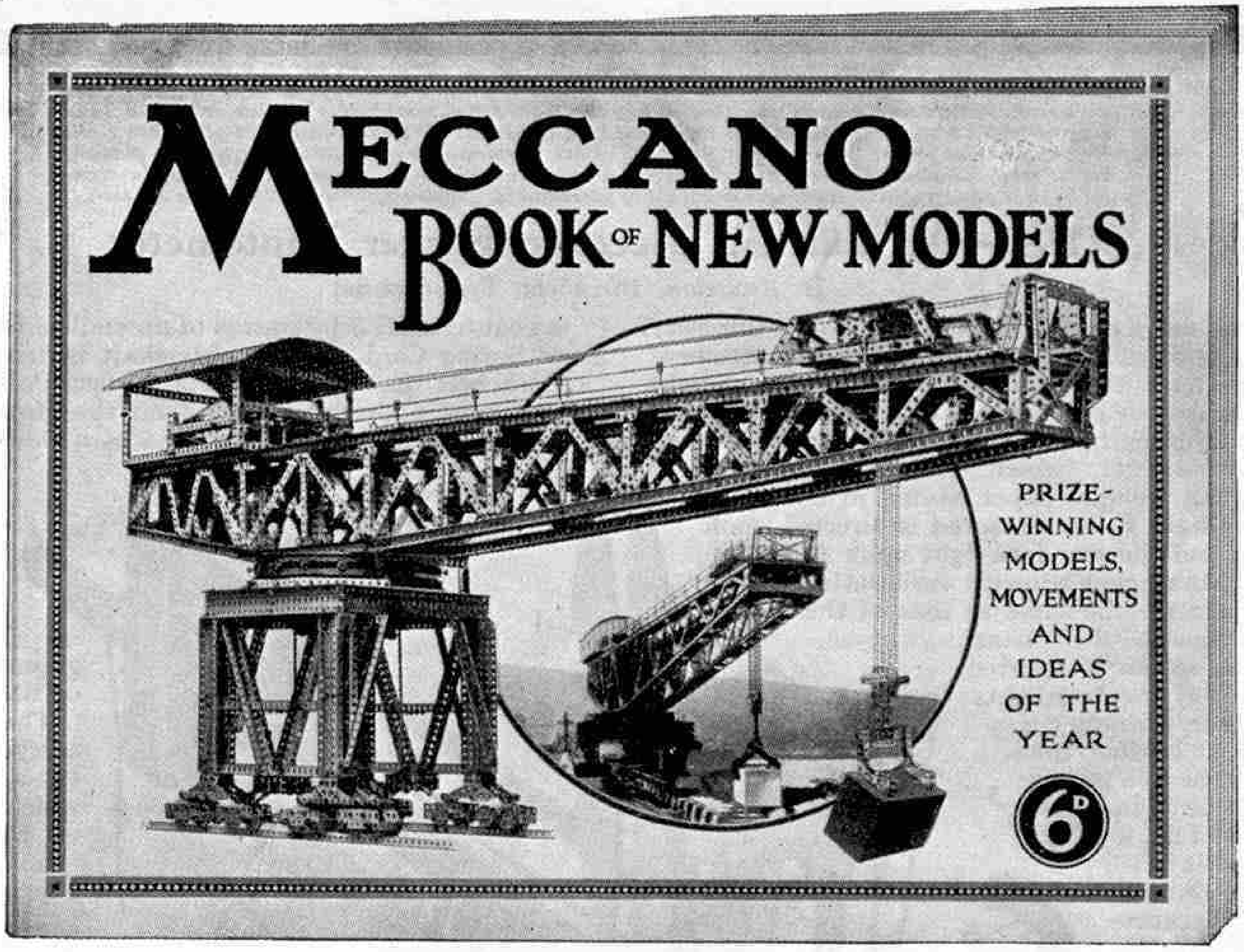

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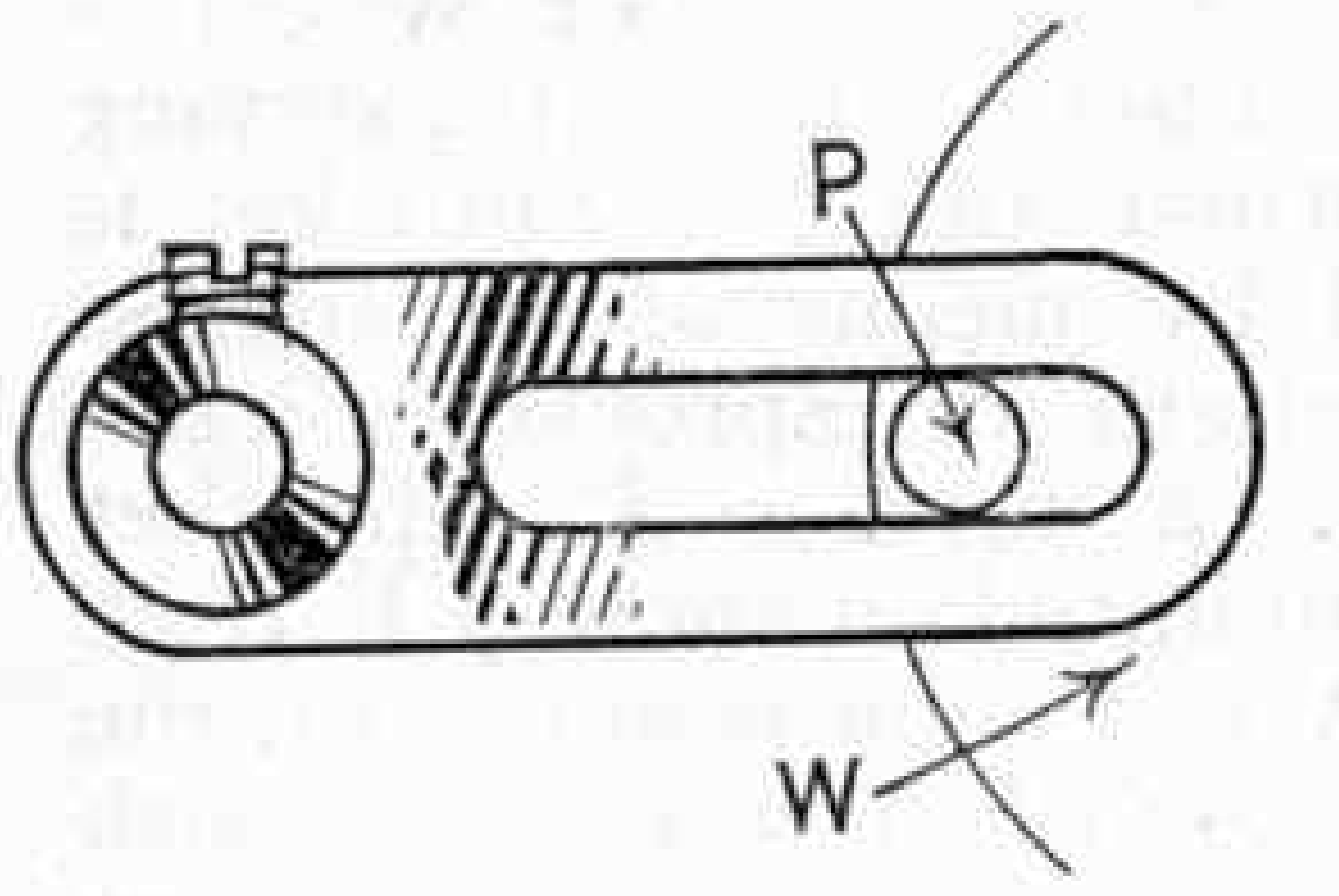
IN REPLY

TO READERS SUGGESTIONS FOR MECCANO IMPROVEMENTS

In this page, month by month, we reply to suggestions regarding improvements or additions to the Meccano system. We receive many hundreds of these suggestions every week, and consequently we are able to publish only ideas that show particular interest or ingenuity. Suggestions submitted for consideration in this section must be written on a separate sheet of paper and the name and address of the sender must appear on each sheet used. Envelopes should be addressed to "Suggestions," Meccano Ltd., Binns Road, Old Swan, Liverpool.

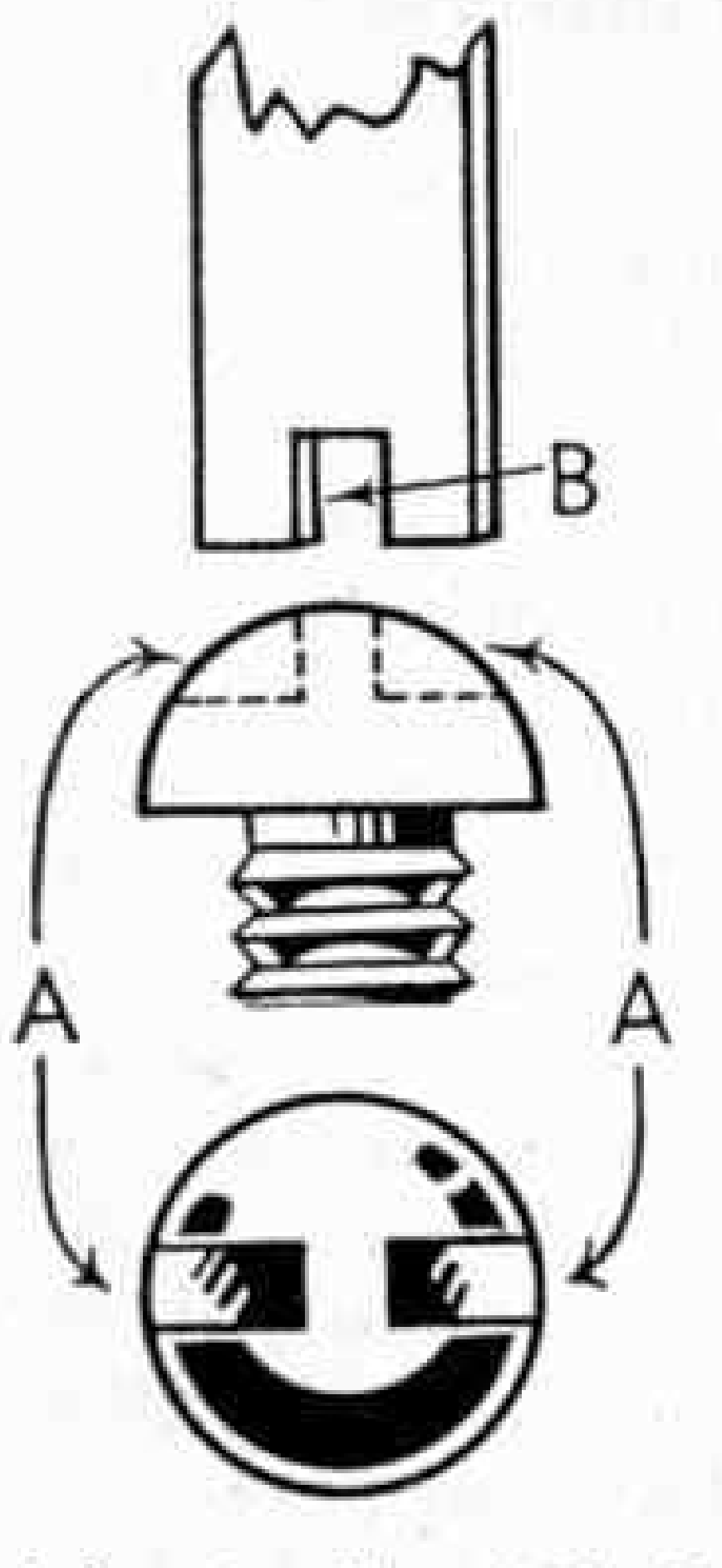
SLOTTED CRANK.—We were interested in your proposal re the introduction of a Crank having a long slot cut in its web. As shown in the accompanying sketch, the part could be used in the construction of a neat gear for providing oscillatory motion in a model, a pin P being passed through the slot in the web and the pin mounted on the face of a wheel W driven by a motor. There are, however, such a large number of simple methods of converting rotary motion to oscillatory motion using standard parts, that we would be hardly justified in introducing your special crank for this purpose alone. However, we are keeping the idea in mind. (*Reply to W. F. Dickmann, Strasbourg, Sask., Canada*).



SLOTTED BUSH WHEEL.—We were interested in your suggestion that four radial slots should be cut in the face of a standard Bush Wheel (part No. 24) so that it might be used as a miniature face plate in a model lathe, etc., in place of the 3″ diam. Face Plate (part No. 110). We are inclined to think, however, that the advantages accruing from the addition of slots would be more than outweighed by the lack of rigidity resulting from the use of slots in place of round holes in other models. However, we are keeping your idea before us. (*Reply to R. P. Printer, Satara, India*).

NEW HINGE.—We were interested in your proposal that a larger hinge should be introduced. We are afraid that the application of a part of this type would be somewhat restricted as it could have few uses that are not already covered by the existing Meccano Hinge (part No. 114), but we are nevertheless keeping your idea in mind. (*Reply to R. McAlter, Timaru, New Zealand*).

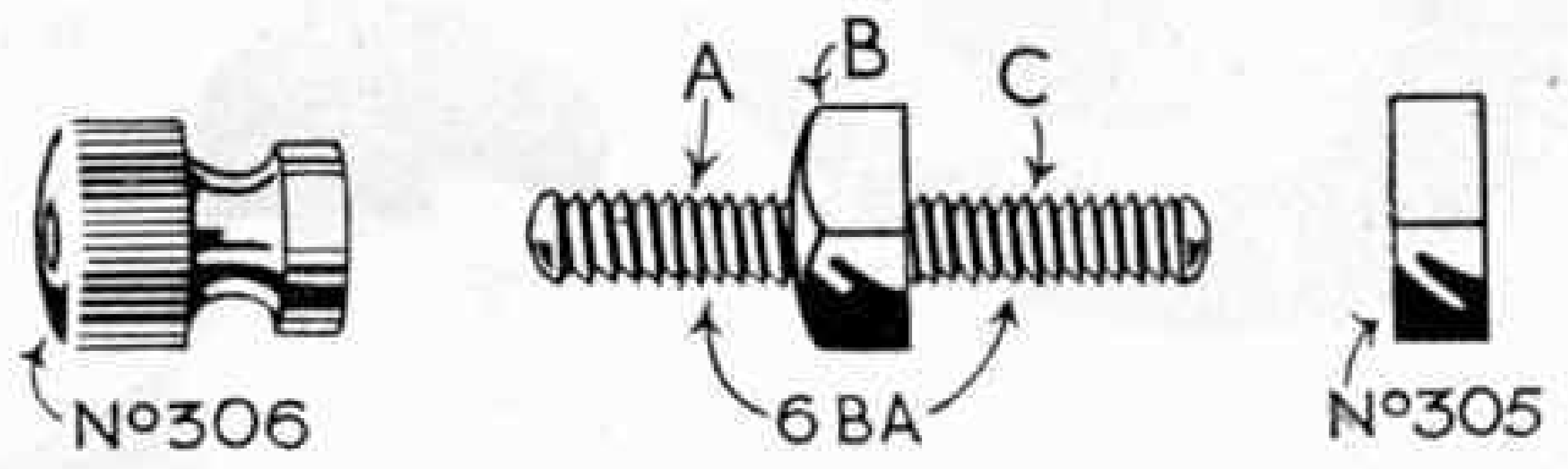
"NON-SLIP" SCREWDRIVER.—The problem of preventing the screwdriver from slipping off the heads of Bolts is evidently proving particularly fascinating to readers as quite a number of clever schemes have been put forward recently. The idea illustrated in the accompanying sketch has been well thought out and would no doubt function quite efficiently in practice. The scheme would be to cut two "blind" slots A in the head of a bolt leaving a small piece of solid metal in the centre. A small slot B would also be cut in the centre of the blade of the screwdriver and this slot would fit over the centre portion of the bolt. Once the screwdriver had been engaged with the bolt, and provided sufficient vertical pressure were maintained, it would be impossible for the driver to slip off the head of the bolt. The great drawback to the adoption of this idea is however, the cost of production as the operation of cutting the special slots would be very intricate. Consequently we cannot consider your idea further. (*Reply to L. Griffin, Beulah Hill*).



ALTERED GEAR.—It would not be advisable to provide the existing 1″ diam. Gear Wheel with an additional boss as this would make the part unnecessarily clumsy. We agree that if an extra boss were fitted, two axle rods could be secured in it, but a Coupling should be used when it is required to do this. The 1″ Gear is used largely in gear boxes and similar mechanisms w ere compactness is a very essential quality and the proposed extra boss would be sure to get in the way, and in the majority of cases serve no useful purpose. (*Reply to D. Harrington, Clumber Park*).

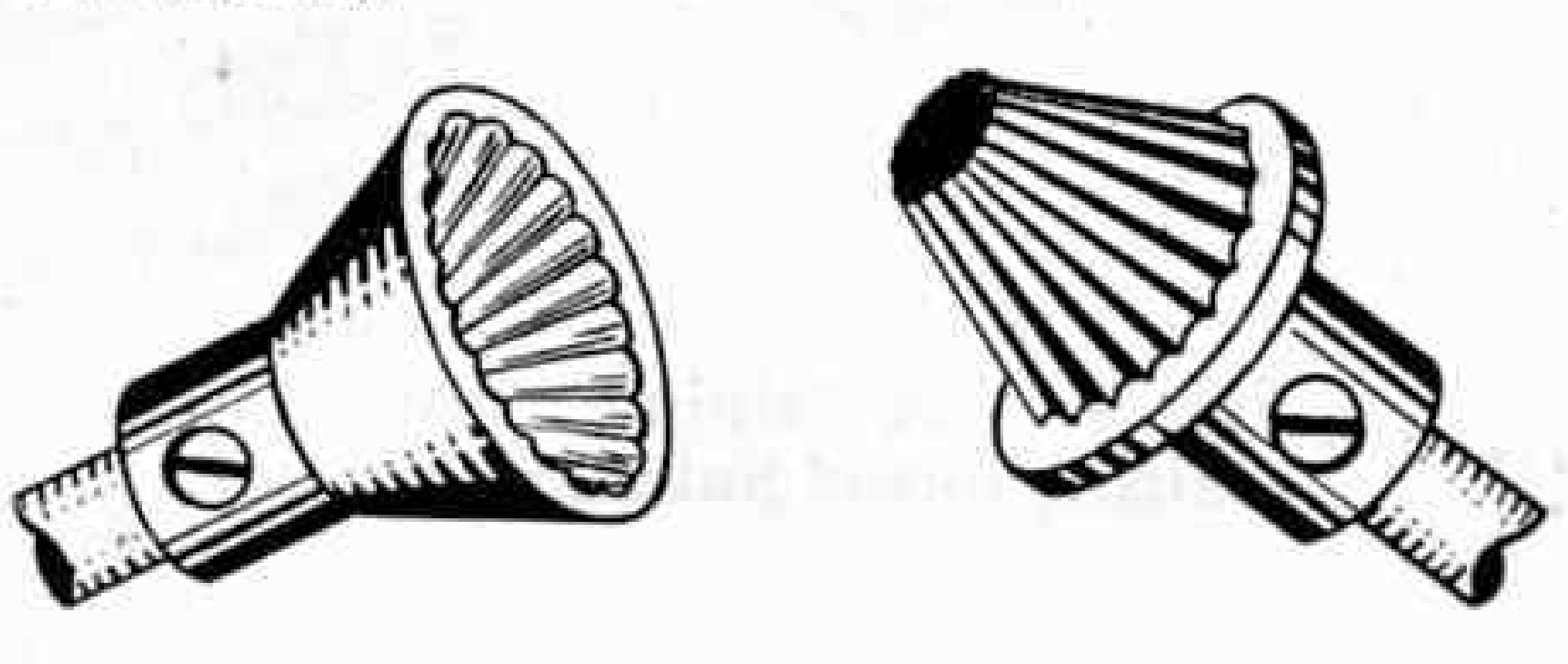
STRANDED WIRE LINE.—We note your idea that lengths of multiple stranded steel wire should be introduced for use as extra strong lifting ropes in models of cranes, etc. Although this idea is quite interesting, we do not consider it necessary to introduce lines of this type as Meccano Cord will generally be found to be quite strong enough for use in most models. In exceptional cases, however, it should be a simple matter to substitute stranded steel or copper wire, which can be obtained quite easily, or the Meccano Wire Line (part No. 141), although primarily intended for use in suspending the 18 lb. weight of the Meccano Clock, should serve this purpose quite well. (*Reply to K. B. Wootton, Hardingstone*).

NEW TYPE TERMINAL.—Your proposal that a new type of 6 B.A. Terminal should be introduced is well thought out, but it is questionable whether your suggested part would offer any advantages over the existing pattern. As shown in the accompanying sketch the new part would have threaded portions A and C cut and tapped 6 B.A., while the centre part B would be formed into a square shoulder that could be rotated by means of a standard Spanner. A Meccano milled Terminal (part No. 306) would be screwed on to the portion A and Meccano 6 B.A. Nuts (part No. 305) fastened on the portion C as required. The terminal assembly resulting from the use of this part would be slightly more adaptable than the existing built-up terminal employing a Meccano 6 B.A. Bolt, but your suggested part would be costly to produce. Consequently we do not consider it advisable to make this addition at the moment but your idea is being filed for further reference. (*Reply to R. Ashworth, Burnley*).

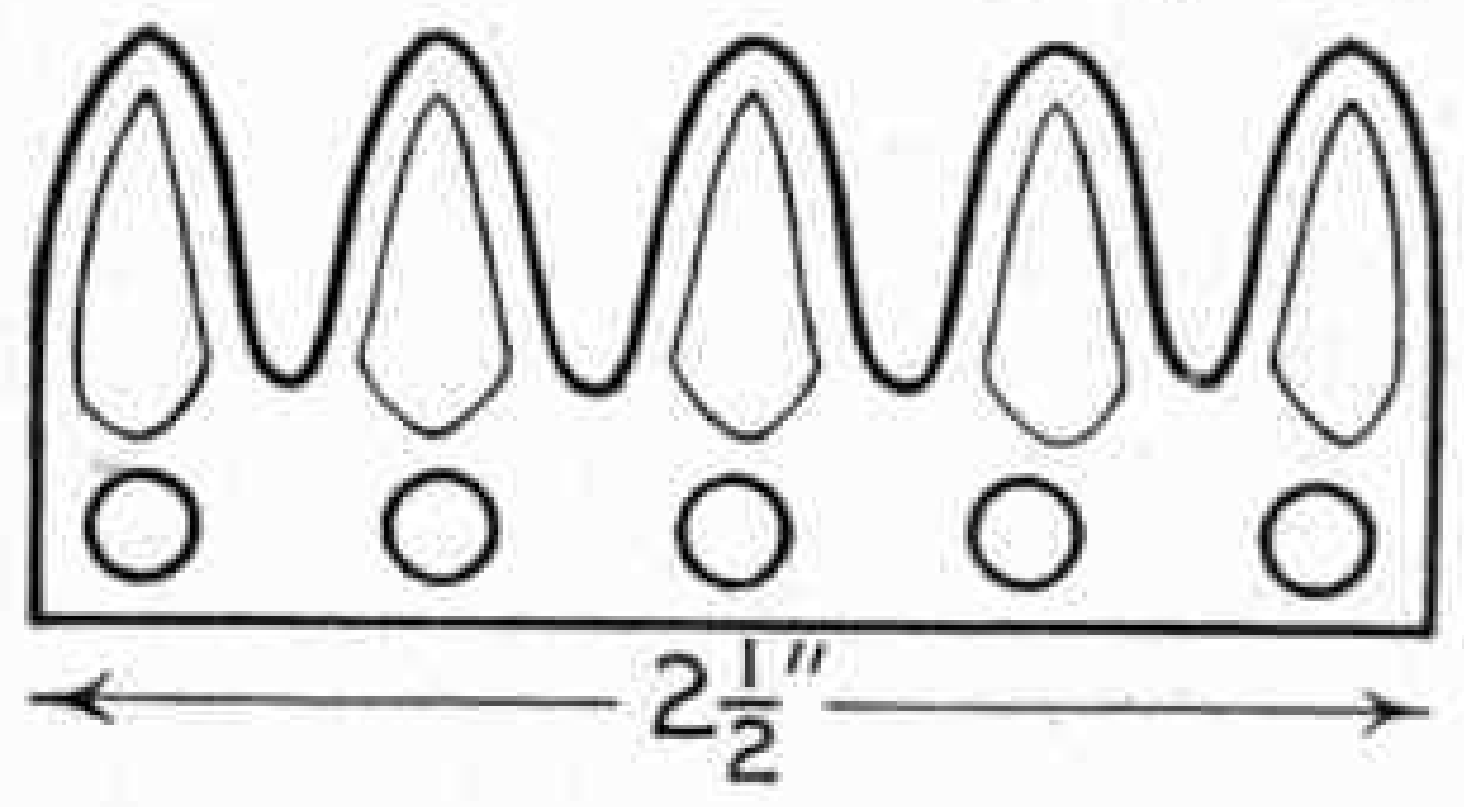


IMPROVED FLANGED PLATE.—We are not in agreement with your idea that two additional flanges should be added to the 3½″ × 2½″ Flanged Plate and that a slot should be cut in the face of this article in a similar manner to the 5½″ × 2½″ Flanged Plate (part No. 52), as this would be equipping it for functions which it is but rarely required to fulfil. (*Reply to W. B. West, Cape Town, S. Africa*).

SERRATED CONE CLUTCH.—Your design for a novel conical clutch unit is certainly very interesting, and for the benefit of other readers we are illustrating the idea below. As will be noted from the sketch, the unit would comprise a hollow member of conical section with a number of serrations or grooves cut on its inner surface, and a second member consisting of a solid cone having serrations cut to correspond with those in the hollow member; both parts would be fitted with standard bosses. We assume that the idea you had in mind in designing this part, was to enable very smooth engagement and disengagement of the two portions of the clutch, which is not altogether possible with the Meccano Dog Clutch unit. Where a very smooth action is required, however, you will find it a much better plan to use a Friction Clutch employing a Rubber Ring such as that used in the Meccano model Chassis (Instruction Leaflet No. 1). This type of clutch enables the load to be taken up very slowly and smoothly, and it is possible to "slip" the clutch without damaging it; if slipping were resorted to in your suggested clutch the teeth of both members would be damaged. (*Reply to M. Deakin, Birmingham*).

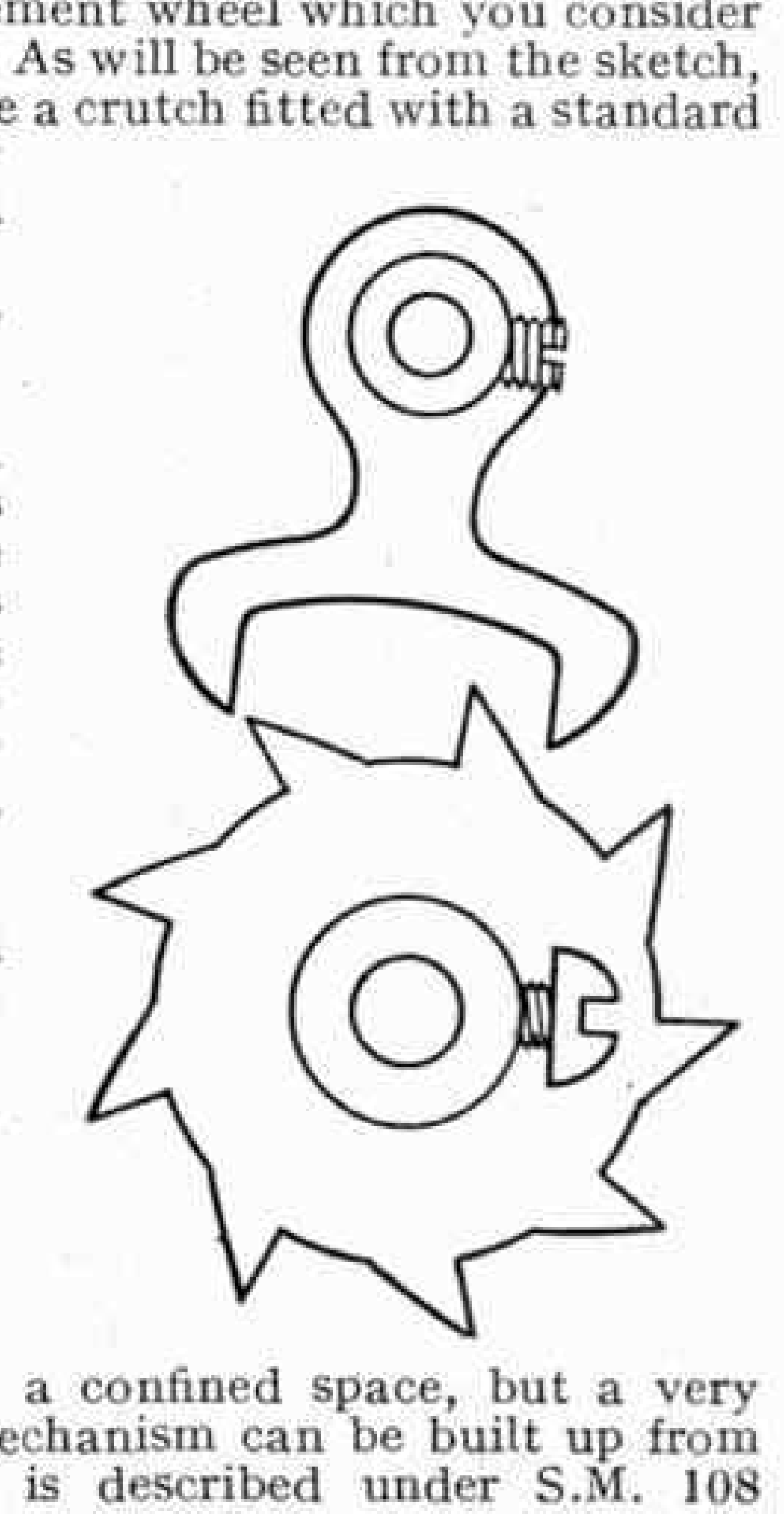


"TINED" STRIP.—There are certainly possibilities in your idea for a Strip having a number of "tines" formed on one side as shown in the sketch, so that it might be used to form the front cutting edge of a digger bucket built from standard parts. If the special Strip were made 2½″ long it could be used in a bucket built-up from 2½″ × 2½″ Flat Plates such as that employed in the Meccano Super Model Steam Shovel (see Instruction Leaflet No. 19). It is quite a simple matter, however, to provide a built-up bucket with "tines" by bolting a number of Flat Brackets or 1½″ Strips to its front edge, and while the "tines" so formed may not be quite as effective as a special unit, they will nevertheless serve their purpose quite efficiently. We are not losing sight of your idea, however, and may be able to consider it later. (*Reply to T. Redman, Calgary, Alberta, Canada*).



NICKELLING PLANT.—Although we are aware that miniature plating plants for the electro-deposition of nickel or silver on base metals are sometimes offered for sale, we do not consider that it would be advisable to add outfits of this type to the Meccano range. We agree that it would be very convenient to be able to "re-nickel" old style Meccano accessories at home when these had become worn, but we would point out that satisfactory results with apparatus of this kind are very difficult to obtain and successful plating can only be accomplished with the aid of extensive and complicated plant such as that used in the Meccano factory. (*Reply to T. W. Woodward, Birmingham*).

ESCAPEMENT.—We have inspected your designs for a crutch and escapement wheel which you consider should be introduced. As will be seen from the sketch, the gear would comprise a crutch fitted with a standard boss and grub-screw and a special toothed wheel also fitted with boss and set-screw. The wheel and crutch would be arranged so that normally one arm of the crutch engages with a tooth of the wheel and prevents movement of the latter, but by oscillating the crutch by means of a pendulum, etc., it lifts off the tooth of the wheel and allows it to rotate until again stopped by the next tooth engaging with the arm of the crutch. These parts might be of some use in models of clocks and governing devices where an escapement gear must be fitted in a confined space, but a very efficient escapement mechanism can be built up from standard parts. This is described under S.M. 108 and 108a on page 20 of the Standard Mechanisms Manual and is incorporated in the mechanism of the Meccano Super Model Clock (see Instruction Leaflet No. 14). We feel sure that most Meccano boys will obtain more pleasure from building up this gear from standard parts than from fitting a ready-made gear in their models, and consequently we do not consider the adoption of your suggestion advisable. (*Reply to T. R. Cole, Southwark*).



LARGE FLAT PLATES.—We do not consider it advisable to introduce flat or flanged plates size 10 ins. × 12 ins. as these would be both cumbersome and expensive to produce and their range of utility would be very limited. (*Reply to P. Astoin, Beaune, Cote d'Or, France*).

New Meccano Models

Clockwork Tractor—Submarine—Flying Boat—Motor Breakdown Crane

VARIETY is an essential factor in every form of perfect entertainment and it certainly plays an important part in the fun to be obtained from model-building with Meccano. The new models illustrated this month represent such diverse subjects as a farm tractor, flying boat, submarine and a motor breakdown crane, so constructors will be sure to find new inspiration for their model-building efforts.

Clockwork Tractor

Every enthusiastic Meccano boy will be familiar with the Meccano super model Traction Engine (Instruction Leaflet No. 22) and its wonderful performance in pulling a boy weighing 140 lb. on a trailer. The feat is of course a great tribute to the power of the Meccano Electric Motor and the strength and accuracy of the gears and structural parts employed in the construction of the model.

Not content with this success however, our expert designers next turned their attentions to the Meccano Clockwork Motor and endeavoured to obtain a similar result from this simple but handy form of power unit. The result of their labours is shown in the Tractor illustrated in Fig. 1, while Fig. 2 clearly demonstrates the remarkable hauling powers of this ingenious model.

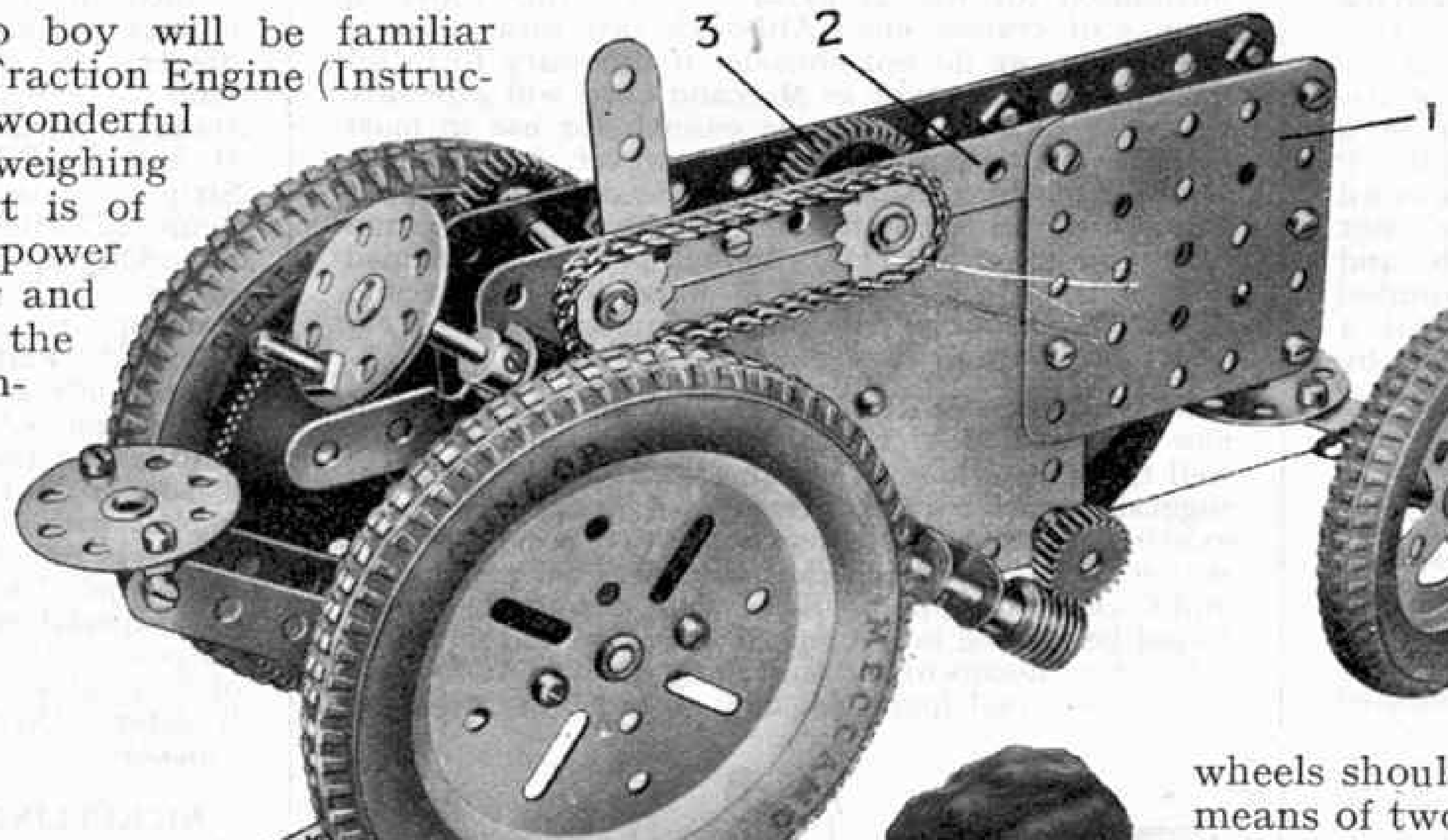


Fig. 1. Clockwork-driven Tractor.

The Clockwork Motor used in the Tractor performs the dual function of " chassis " and power unit, and a 5½" Strip 2 and a 2½" × 2½" Flat Plate 1 should be bolted to each Motor side plate as shown in Fig. 1. The Plates 1 are held at the correct distance apart by means of two Double Brackets, Washers being placed on the shanks of the bolts holding them in place in order to provide the correct spacing. The centre holes of these Brackets form journals for a 2" Rod about which the front road axle pivots. Each road wheel consists of a 2" Pulley fitted with a Dunlop Tyre, and is mounted on a Pivot Bolt secured in a 2½" × ½" Double Angle Strip. A Bush Wheel is bolted to the centre of the Angle Strip and the 2" Rod previously mentioned is secured in the boss of the Bush Wheel, thus completing the front road axle assembly.

The steering gear comprises a 6½" Axle Rod mounted in journals consisting of Double Brackets bolted to the right-hand side plate of the Motor. A Bush Wheel fitted with a Threaded Pin is mounted on the upper end of this Rod, and a Worm is secured to its lower end. The Worm meshes with a ½" Pinion that is mounted on a 1" Rod journalled in the Motor side plates. A length of cord should be wound round this Rod and the ends tied to the extremities of the 2½" Double Angle Strip forming the front axle.

Every owner of a Clockwork Motor will know that the " torque " or " turning effort " of the driving shaft of the Motor is not always sufficient to drive models, and in order to obtain a larger torque, reduction gearing must be included so as to obtain a mechanical advantage. The method by which a powerful torque has been obtained in the model Tractor is interesting.

The train of gears between the primary shaft of the Motor and the driving shaft provides a " step-up " in speed, and if a further train of gears giving a reduction ratio were coupled to the driving shaft, the effect of the two sets of gears would be to " balance " or " neutralise " each other and the main purpose of the reduction train would to some extent be lost. In the model Tractor, however, the " step-up " gear train is not employed, the drive being taken direct from the primary gear of the clockwork mechanism in the following manner. A 1" Gear Wheel 3 is mounted on a 1" Axle Rod journalled in the Motor side plates in such a way that it meshes with the primary gear wheel of the Motor. A ¾" Sprocket Wheel is also mounted on the shaft carrying the 1" Gear and this Sprocket is coupled by means of an endless length of Sprocket Chain, to a further ¾" Sprocket mounted on another 1" Rod. A ½" Pinion fastened on the second 1" Rod engages with the teeth of a 3½" Gear secured to the rear road axle. The 3½" Gear should be locked securely to its axle by means of two set-screws and the 3" Pulley forming one of the road wheels should be fastened rigidly to the Gear by means of two ¾" Bolts. A Bush Wheel should be locked by means of two set-screws to the other end of the axle and the second 3" Pulley in addition to being secured by its set-screws, should be attached rigidly to it by two further ¾" Bolts.

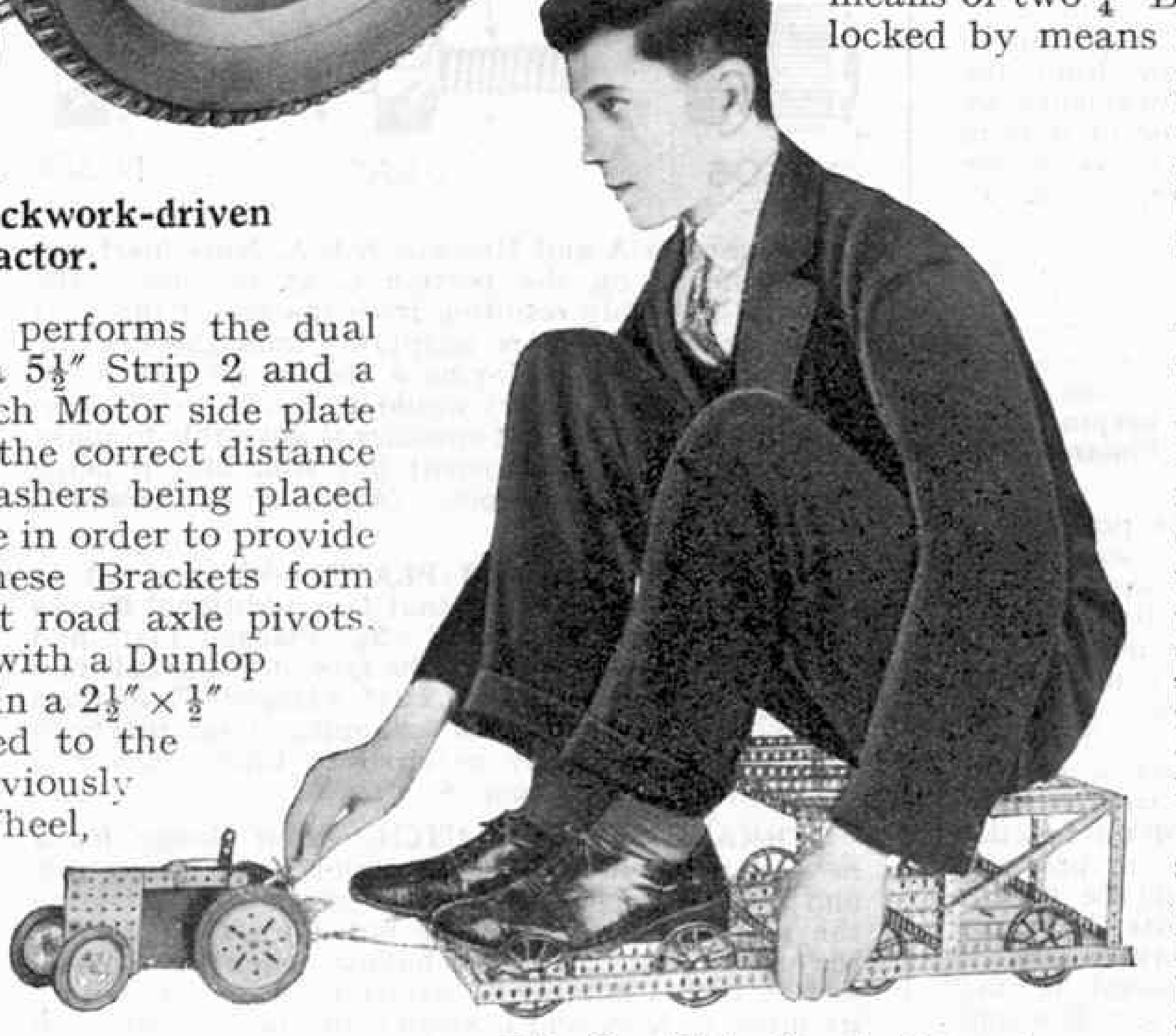


Fig. 2. This illustration shows the Clockwork Tractor hauling its driver !

The drawbar 4, by means of which a trailer can be coupled to the tractor, consists of a 3½" Axle Rod fitted with an End Bearing at one end and secured rigidly in a Coupling at the other. A 1" Axle Rod is passed through the transverse bore of this Coupling, the Rod being journalled in the bottom row of holes in the side plates of the Motor and held in place by means of Collars.

The 3" Strips forming the supports for the driver's seat are secured to 1" Triangular Plates which, in turn, are bolted to the side plates of the Clockwork Motor.

In order to test the pulling power of the model a trailer of some kind should be constructed. The one shown in Fig. 2 has been built from a number of Angle Girders, and this form of construction provides a rigid frame which will safely support the weight of even the most robust Meccano boy ! The frame runs on eight 3" Wheels, which are mounted loosely on axles that are carried in multiple bearings.

The Tractor contains the following parts :—

2 of No. 2 ; 2 of No. 3 ; 4 of No. 11 ; 4 of No. 12 ; 1 of No. 14 ; 1 of No. 15a ; 1 of No. 16 ; 1 of No. 16a ; 4 of No. 18a ; 2 of No. 19b ; 2 of No. 20a ; 5 of No. 24 ;

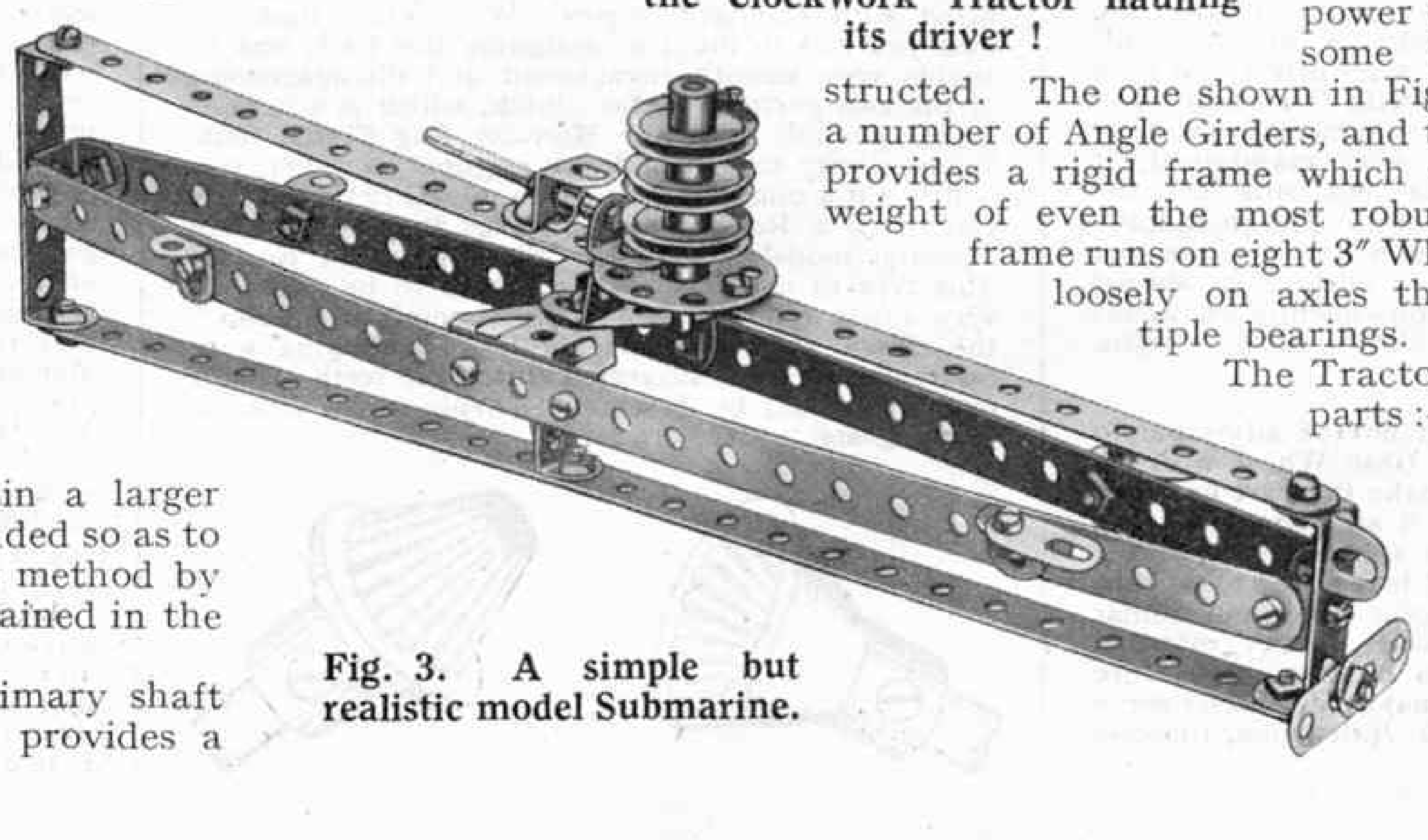


Fig. 3. A simple but realistic model Submarine.

2 of No. 25 ; 1 of No. 27b ; 1 of No. 31 ; 1 of No. 32 ; 30 of No. 37 ; 12 of No. 38 ; 1 of No. 48a ; 9 of No. 59 ; 1 of No. 63 ; 2 of No. 72 ; 2 of No. 77 ; 9″ of No. 94 ; 2 of No. 96a ; 6 of No. 111 ; 1 of No. 115 ; 2 of No. 142a ; 2 of No. 142b ; 2 of No. 147b ; 1 of No. 166 ; 1 Clockwork Motor.

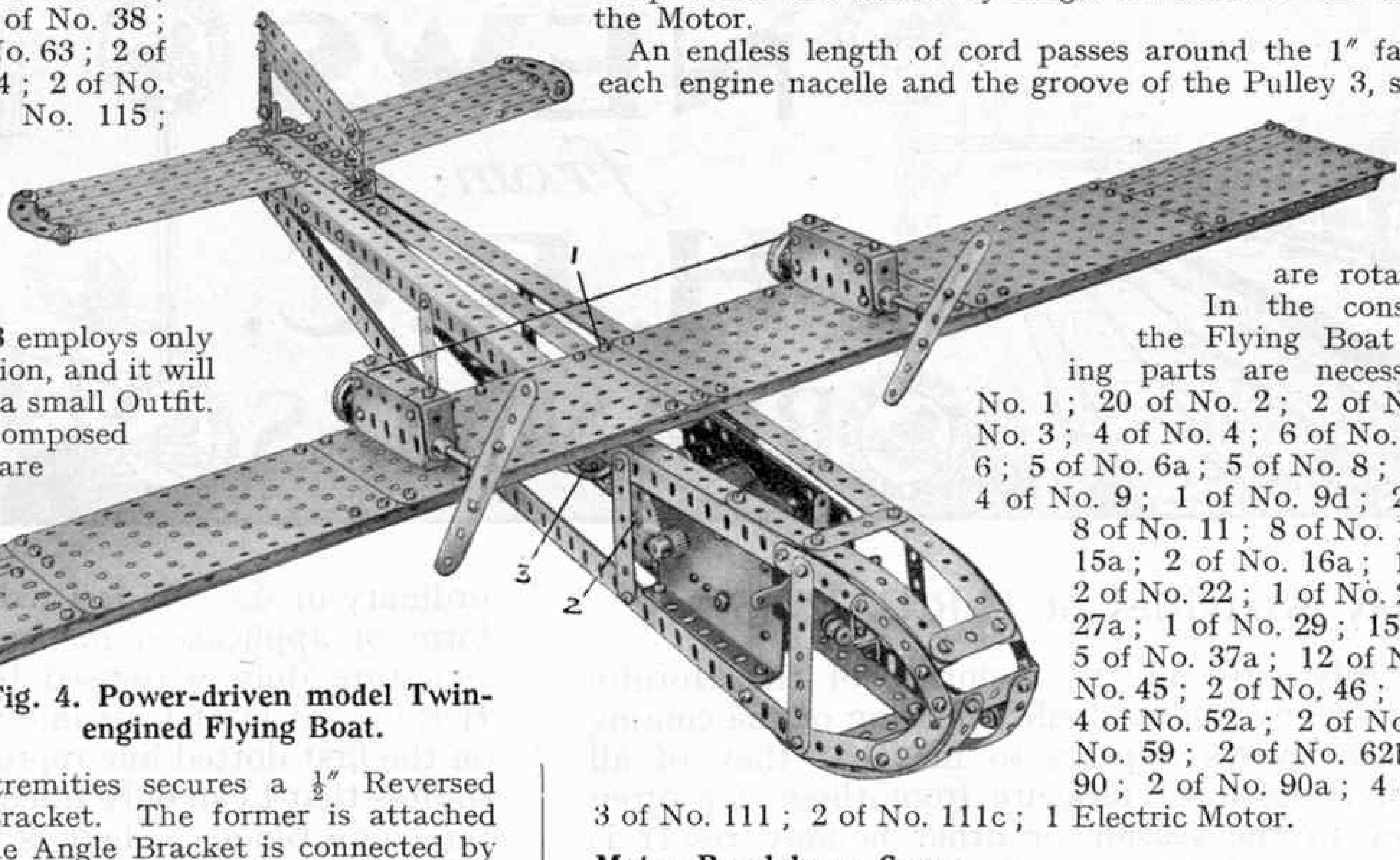


Fig. 4. Power-driven model Twin-engined Flying Boat.

A Simple Model Submarine

The submarine shown in Fig. 3 employs only a few simple parts in its construction, and it will therefore appeal to the owner of a small Outfit.

The hull of the submarine is composed of four 12½″ Strips whose ends are bolted to a 1½″ × ½″ and a 2½″ × ½″ Double Strip at the prow and stern respectively. Trunnions are bolted to the side 12½″ Strips, and a bolt passed through their inner extremities secures a ½″ Reversed Angle Bracket and an Angle Bracket. The former is attached to the upper 12½″ Strip while the Angle Bracket is connected by means of a Flat Bracket and a further Angle Bracket to the lower Strip.

The "propeller" is merely two Flat Brackets mounted on a ⅜″ Bolt by means of nuts. To complete the model it is only necessary to attach the "stabiliser fins" and "depth rudders" to the sides of the hull, these consisting of Angle Brackets and Flat Brackets.

The following parts are used in the model Submarine: 4 of No. 1 ; 5 of No. 10 ; 2 of No. 11 ; 8 of No. 12 ; 2 of No. 17 ; 3 of No. 22 ; 1 of No. 24 ; 2 of No. 35 ; 25 of No. 37 ; 2 of No. 37a ; 1 of No. 47 ; 1 of No. 48 ; 1 of No. 111c ; 2 of No. 125.

Twin-Engined Flying Boat

One of the most interesting of the many types of modern aircraft is the flying boat. Strangely enough this type of craft has received comparatively little attention from model-builders and the example of a twin-engined flying boat shown in Fig. 4 should therefore be of particular interest.

The hull of this fine model is built up from Angle Girders and Curved Strips, the arrangement of these being shown clearly in the illustration. The Flat Plates of the main plane are secured to a composite girder, which consists of one 12½″ Angle Girder extended at each end by 9½″ Girders and is bolted along the leading edge of the plane with the projecting flange toward the tail of the model. A 2½″ Angle Girder is bolted to the centre of the girder so formed and is secured, in turn, across the fuselage. The wings are held rigid by the ¾″ Bolt 1, which is passed through the 12½″ Strip in the centre of the fuselage but is spaced therefrom by a Collar.

The Electric Motor is fixed to the lower pair of Angle Girders of the fuselage. The armature spindle of the Motor carries a ½″ Pinion meshing with a 57-teeth Gear on the 2½″ Rod 2, which also carries a ¾″ Contrate Wheel that engages with a Pinion on the Rod on which the 1½″ Pulley 3 is mounted. Bearings for the Rod are formed by a 1½″ Strip and Double Bent Strip which are bolted by Angle Brackets to the side plates of the Motor.

An endless length of cord passes around the 1″ fast Pulley of each engine nacelle and the groove of the Pulley 3, so that when the Electric Motor is set in motion the propellers are rotated rapidly.

In the construction of the Flying Boat the following parts are necessary: 3 of No. 1 ; 20 of No. 2 ; 2 of No. 2a ; 5 of No. 3 ; 4 of No. 4 ; 6 of No. 5 ; 2 of No. 6 ; 5 of No. 6a ; 5 of No. 8 ; 4 of No. 8a ; 4 of No. 9 ; 1 of No. 9d ; 2 of No. 10 ; 8 of No. 11 ; 8 of No. 12 ; 2 of No. 15a ; 2 of No. 16a ; 1 of No. 21 ; 2 of No. 22 ; 1 of No. 26 ; 1 of No. 27a ; 1 of No. 29 ; 154 of No. 37 ; 5 of No. 37a ; 12 of No. 38 ; 1 of No. 45 ; 2 of No. 46 ; 1 of No. 48 , 4 of No. 52a ; 2 of No. 53a ; 5 of No. 59 ; 2 of No. 62b ; 4 of No. 90 ; 2 of No. 90a ; 4 of No. 103f ; 3 of No. 111 ; 2 of No. 111c ; 1 Electric Motor.

Motor Breakdown Crane

The term "breakdown crane" generally is associated with a massive steam driven machine capable of lifting railway engines, but this monster of the railways now has its counterpart on the road in the form of a motor lorry fitted with a crane, the model shown in Fig. 6 being typical of a vehicle of this type.

The superstructure of the lorry (see Fig. 6) is quite simple and calls for no special comment. The chassis frame consists essentially of two 12½″ Angle Girders spaced apart at their ends by 3½″ Strips. A 5½″ × 2½″ Flanged Plate is secured to the rear of the frame by means of Angle Brackets and serves as a platform upon which the crane swivels.

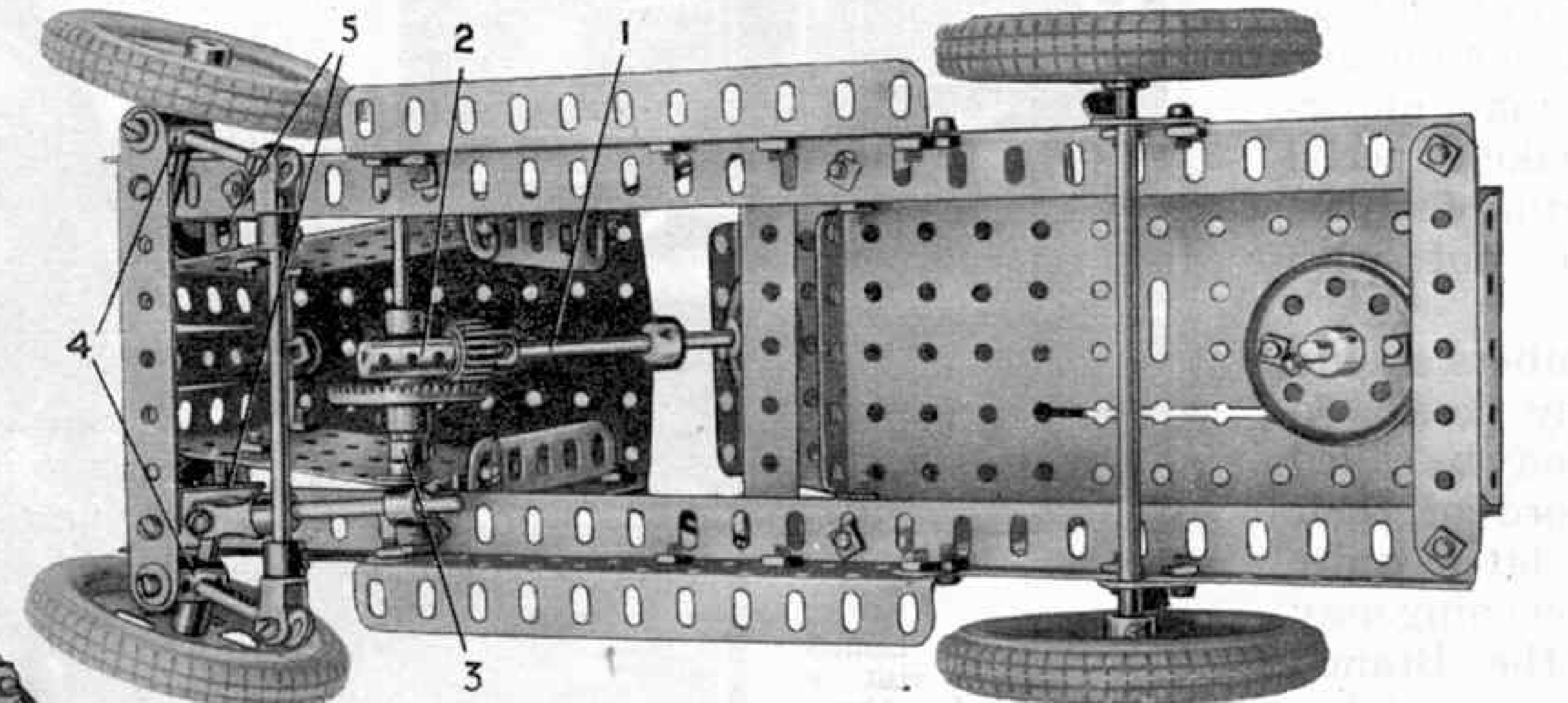


Fig. 5. View of underside of Motor Breakdown Crane, showing the Steering Gear assembly.

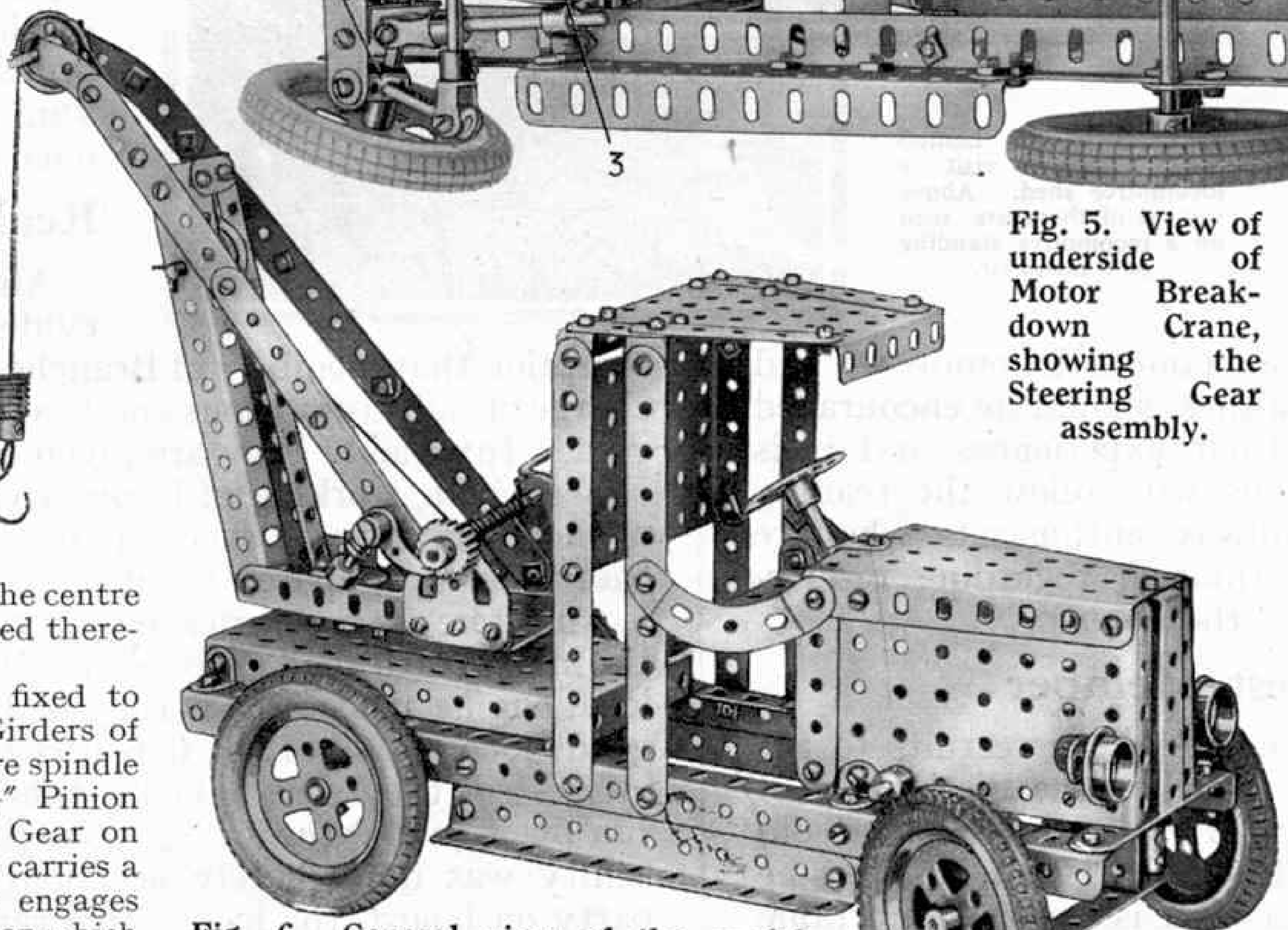


Fig. 6. General view of the model Motor Breakdown Crane, showing bodywork construction and crane mechanism.

The arrangement of the steering gear and front axle can be followed from Fig. 5, which shows the underside of the lorry. The bearings for the steering column 1 are formed by a Flat Bracket and a Coupling 2. A 2½″ Rod passes through the centre transverse hole of the latter and carries a 1½″ Contrate Wheel that is spaced by means of three Washers from the Coupling. The teeth of the Contrate are engaged by a ½″ Pinion on the Rod 1. The Crank 3 also is secured to this Rod and carries a Flat Bracket bolted so that its round hole is over the elongated perforation of the Crank, and a bolt is passed through both Crank and Flat Bracket and then screwed into the tapped bore of a Collar on a 2″ Rod. This Rod is attached pivotally to the inner end of one of the stub axles by means of a Swivel Bearing.

The front road wheels rotate freely on the 1½″ Rods forming the stub axles, and are held in position by Collars. The 1½″ Rods are secured in Couplings 4 which are pivoted by means of ⅜″

Continued on page 580

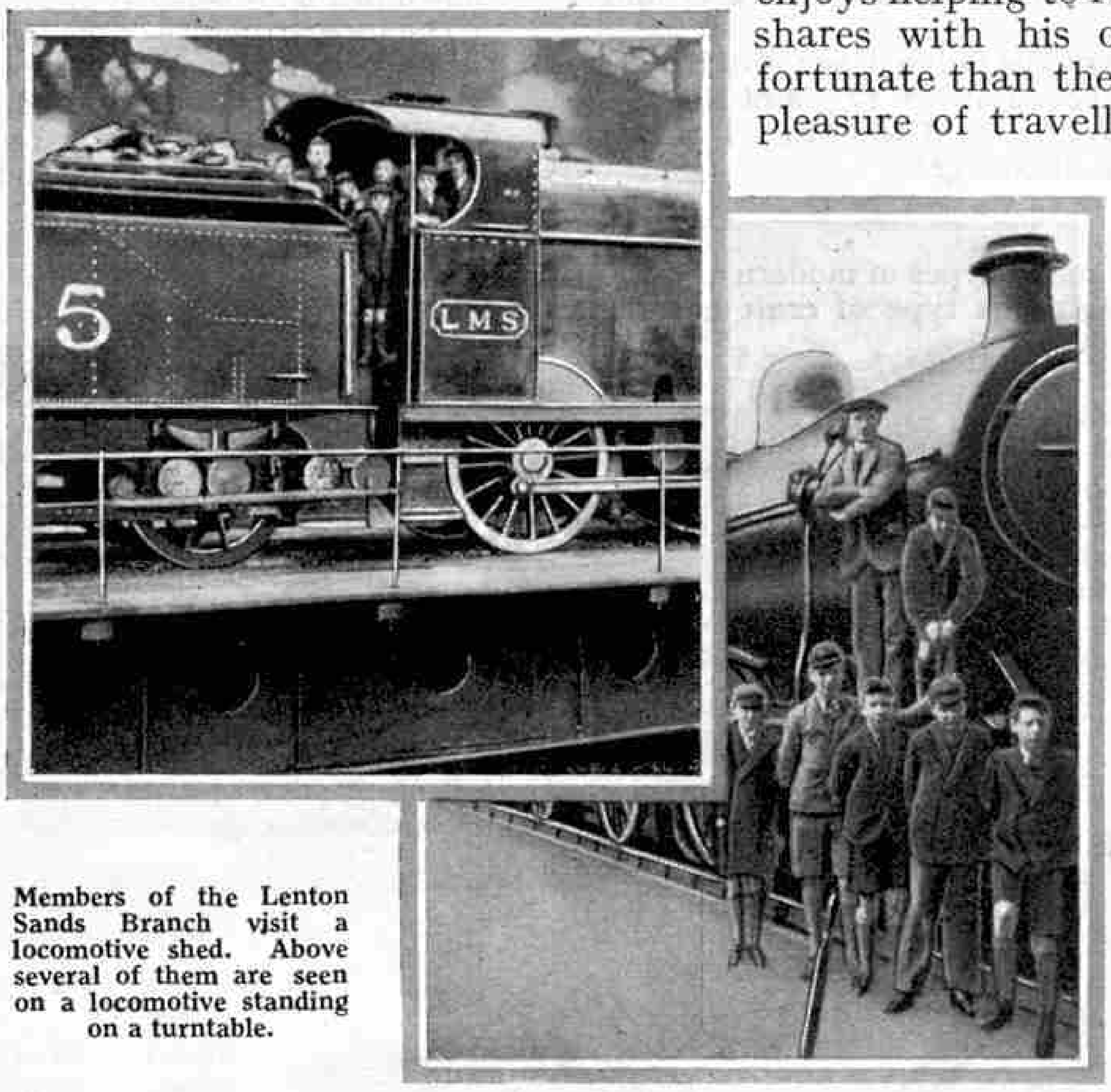
NEWS *from* H. R. C. BRANCHES

Holiday Activities of H.R.C. Members

During July most of the members of the Hornby Railway Company are no doubt thinking of the coming holidays. It always appears to me that they of all people derive the most pleasure from these, for often the journey to the seaside or other holiday resort is made by train, and wherever they go they find themselves amid new railway surroundings and have many opportunities of extending their knowledge of methods of working and indeed of railway affairs in general.

I need scarcely remind members to keep a good look-out for interesting locomotives, notable stations and tunnels, or railway features of any kind that are unfamiliar to them. It is a very good plan to map out beforehand the route of a railway journey they may undertake, and to make a special note of interesting features that they do not wish to miss.

Branch members should be particularly keen on keeping what may be called a railway record of their holidays, for later quite an interesting evening may be spent in the Branch room exchanging holiday reminiscences of a railway character. Members who have made journeys of special interest, or have seen famous locomotives and express trains in distant localities, should be encouraged to give brief accounts of their experiences and it is certain that lively discussions will follow the reading of the journals of keen railway enthusiasts who are able to give first-hand information regarding railway practice in different parts of the country.



Members of the Lenton Sands Branch visit a locomotive shed. Above several of them are seen on a locomotive standing on a turntable.

Our Youngest Member

One of the most interesting of recent recruits to the Hornby Railway Company also has the distinction of being the youngest member. He is only one year old and naturally is very small, so small in fact, that he travels in a milk traffic van, and is quite comfortable in his somewhat restricted quarters!

The name of this remarkable member is Bingo, and he is a pet mouse. Clearly he is quite different from an ordinary mouse, for as I write I have in front of me his form of application for membership, on which is his signature duly witnessed by an older member of the H.R.C. At least I assume that certain pencil markings on the first dotted line represent his signature, but must confess that I can only trace a very slight resemblance to the name Bingo. There is perhaps nothing remarkable in this, for I receive quite a number of letters daily in which the signature is indecipherable!

The number assigned to the youngest member of the Hornby Railway Company is 16678 A. He thoroughly enjoys helping to run trains on the layout that he shares with his owner. In fact, he is more fortunate than the latter, for he actually has the pleasure of travelling in the trains themselves. The van in which he makes his journeys should perhaps be re-named Mouse Traffic Van, for instead of milk churns it contains bran placed there in order to sustain him on the long non-stop express runs that he often undertakes. On arrival at the terminal station he immediately gets out and waits on the platform until it is time for another journey. A touch on the tail is the signal that sends him back into the van and away he goes once more.

Real Railway Work!

Almost daily I receive evidence of the splendid reception that members of Branches receive from those in charge of railway stations and locomotive sheds that they visit. Invariably they are given splendid opportunities of seeing the working of locomotives, and often a group of members may be seen on the footplate of an engine that is being prepared for its day's work.

An interesting experience of this kind fell to the lot of the members of the Lenton Sands Branch on a visit to the local engine shed. After they had carefully inspected a goods locomotive of the 0–6–0 type in which they were interested, they were asked if they would like to take a run on it to the turntable. Needless to say the opportunity was immediately accepted, and, with half the party on board, the locomotive ran on to the turntable in the centre of the shed. There it was reversed by the members themselves, who were delighted with their brief experience of real railway work.

Branch Notes

King's Heath.—A very interesting visit has been paid by several members to King's Cross, Waterloo and Victoria Stations, London. At Waterloo they saw "*Lord Nelson*" and "*Lord Anson*," and "*Victor Wild*" and "*Robert the Devil*" were present at King's Cross. An interesting Branch magazine is being produced each month and the secretary would like to exchange copies with those produced by other Branches. Cycling tours to places of railway interest are being arranged and a cricket team has been formed. Secretary: K. Icke, 65, Livingstone Road, King's Heath, Birmingham.

The Hall (Sydenham).—A very successful Exhibition has been held. Two railway tracks were laid and were operated continuously throughout the day. Several Meccano models also were displayed. These included the Meccanograph, the model realising a profit of 10/6. Rails and points for an extensive Branch track have been purchased with the proceeds of the Exhibition. Secretary: J. D. Davies, 28, Kingsthorpe Road, Sydenham, London, S.E.26.

Whitgift Grammar School.—The chief interest of a successful Exhibition centred in a large Hornby Train layout, the main lines of which were electrified. A complete service of electric and clockwork trains was run, express, local and goods trains being despatched from the terminus every few minutes. Scale speed tests of Branch locomotives have been made, and a visit paid to East Croydon Goods Yard. Secretary: R. Hall, 55, Kendall Avenue South, Sanderstead, Surrey.

Members of the Wherwell Branch, No. 3. Chairman, Mr. P. Trodd. Secretary, Jack Pyke. This was one of the earliest Branches incorporated and the enthusiasm of members is well maintained. A speciality is made of strict timetable working.

Lytham Central.—The newly-built track was put into operation with due ceremony and members are now concentrating on timetable working. Cork chippings used for packing grapes have been employed with success as ballast. An interesting debate on "*Railways v. Road*" has been held. The official forms of the Hornby Railway Company are to be used in track working and other operations. Secretary: F. Lucas, 2, Church Road, Lytham.

Plymouth (St. Bartholomew's).—Reorganisation of the Branch has been completed, and there is now room for more members. Railway enthusiasts who desire to join should write to the secretary. Debates have taken place on "*Bridge v. Tunnel as means of crossing R. Tamar*" and "*Is Railway Transport Superior and Safer than Road?*" Outdoor track laying and operation is now a regular feature of the Branch programme. Secretary: Sidney Brenton, 53, Ford Hill, Stoke, Plymouth.

First York.—Great care is being taken in constructing a permanent Branch layout. Plans submitted by four members of the Branch are being laid down and operations on them carried out for a time before a final choice is made. Secretary: K. Shannon, 38, Severus Avenue, Acomb, York.

Gloucester.—A visit has been paid to the Lydney Tin Plate Works. Particular interest was shown in the rolling mills, and the gantry crane and "grab," known as the "iron man," also were found extremely fascinating. An interesting discussion has been held on the old puzzle "*Does the tyre of a locomotive wheel run faster than the axle?*" Secretary: G. T. Clarke, 66, Falkner Street, Gloucester.

Lenton Sands (Nottingham).—Members visited the Motive Power Department of the L.M.S. at Nottingham, where several interesting snaps were obtained by the Branch photographer. The Junior Section of the Branch are now working in their old club room and members are busily engaged constructing a shelf on which to lay down a permanent track. Secretary: F. W. Byron, 125, Harrington Drive, Lenton Sands, Nottingham.

West Kent.—Members visited the Exhibition held by the Wimbledon Meccano Club, and greatly enjoyed watching the operation of the model railway. A permanent layout is being established, the members paying increased subscriptions in order to enable this to be done on an adequate scale. Secretary: F. R. Dubery, 48, Reddons Rd., Beckenham, Kent.

OVERSEAS

Sea Point (Cape Town).—At the Exhibition of the South African Meccano Union, members assisted in the building and operation of a large model railway. The Meccano Agent at Cape Town kindly lent track and rolling stock, and Mr. H. C. Versfelt, Vice-President of the Branch, provided effective scenery, including a large number of telegraph poles. Operations conducted by senior members of the Branch attracted interested attention from visitors, a large service of trains being run strictly to timetable on a 150 ft. track. Secretary: N. Broughton, P.O. Box 1247, Cape Town.

South Kogarah (Australia).—Hornby Control has been installed at "Kogarah Junction" on the Branch layout in order to make easier the operations of the heavy traffic passing this point. The junction itself has been remodelled, the island platform that it formerly possessed having been converted into an extensive covered station. Colour light signals have been made and the various stations are being connected up by telephone. Members are practising train make-up and fly shunting, and also are building a larger Branch room in order to extend activities. The secretary will be very pleased to welcome any new members. Secretary: H. Walsh, "Bringa," Princess Highway, Kogarah, Sydney, N.S.W., Australia.

Further Branches in Course of Formation

The following new Branches of the Hornby Railway Company are at present in process of formation and any boys who are interested and desirous of linking up with this unique organisation should communicate with the promoters, whose names and addresses are given here. All owners of Hornby trains or accessories are eligible for membership, and the various secretaries will be pleased to extend a warm welcome to all who send in their applications:—

Dewsbury—G. R. Dean, 69, South Street, Savile Town, Dewsbury, Yorks.

Glasgow S.W.2—Colin Sinclair, St. Margaret's, 50, Ralston Avenue, Crookston, Glasgow.

London, S.W.—G. Hills, 110, Worple Road, Wimbledon, London, S.W.

Norfolk—R. Chapman, 6a, St. Nicholas Street, Diss, Norfolk.

Oxford—S. J. Rhodes, 45, Canning Crescent, Oxford.

York—E. Eastwood, 4, Watson Street, Holgate Road, York.

OVERSEAS

Australia—W. McP. Eady, "Inveresk," Sackville Street, East Kew.

Further H.R.C. Incorporated Branches

122. Eng. Soc. Jun. (Harrogate)—Neil Stevenson, Ashville College, Harrogate.
123. Saint Nicholas (Birmingham)—E. F. Field, 17, Meadow Hill Road, King's Norton, Birmingham.
124. First Stamford—E. J. Belton, 43, Casterton Road, Stamford, Lincs.
125. First Reading—S. G. Burley, 12, Gloucester Road, Reading.
126. First Hastings—S. W. Heyburn, 7, Braybrooke Terrace, Hastings.
128. Chingford Model Railway Club—D. G. Tucker, 31, Frederica Road, Chingford, E.4.
129. St. David's Railway Club—Mr. T. Pope, 12, Wyndham Street, Ogmore Vale, Nr. Bridgend.

OVERSEAS

127. First Alexandria—W. D. Draycott, 44, Rue Tigran Pasha, Sporting Club, Alexandria, Egypt.

MEMBERS OF THE H.R.C. ARE ENTITLED TO WEAR THIS BADGE WHICH IS BEAUTIFULLY ENAMELLED IN COLOURS

Hornby Railway Company

JUNIOR SECTION

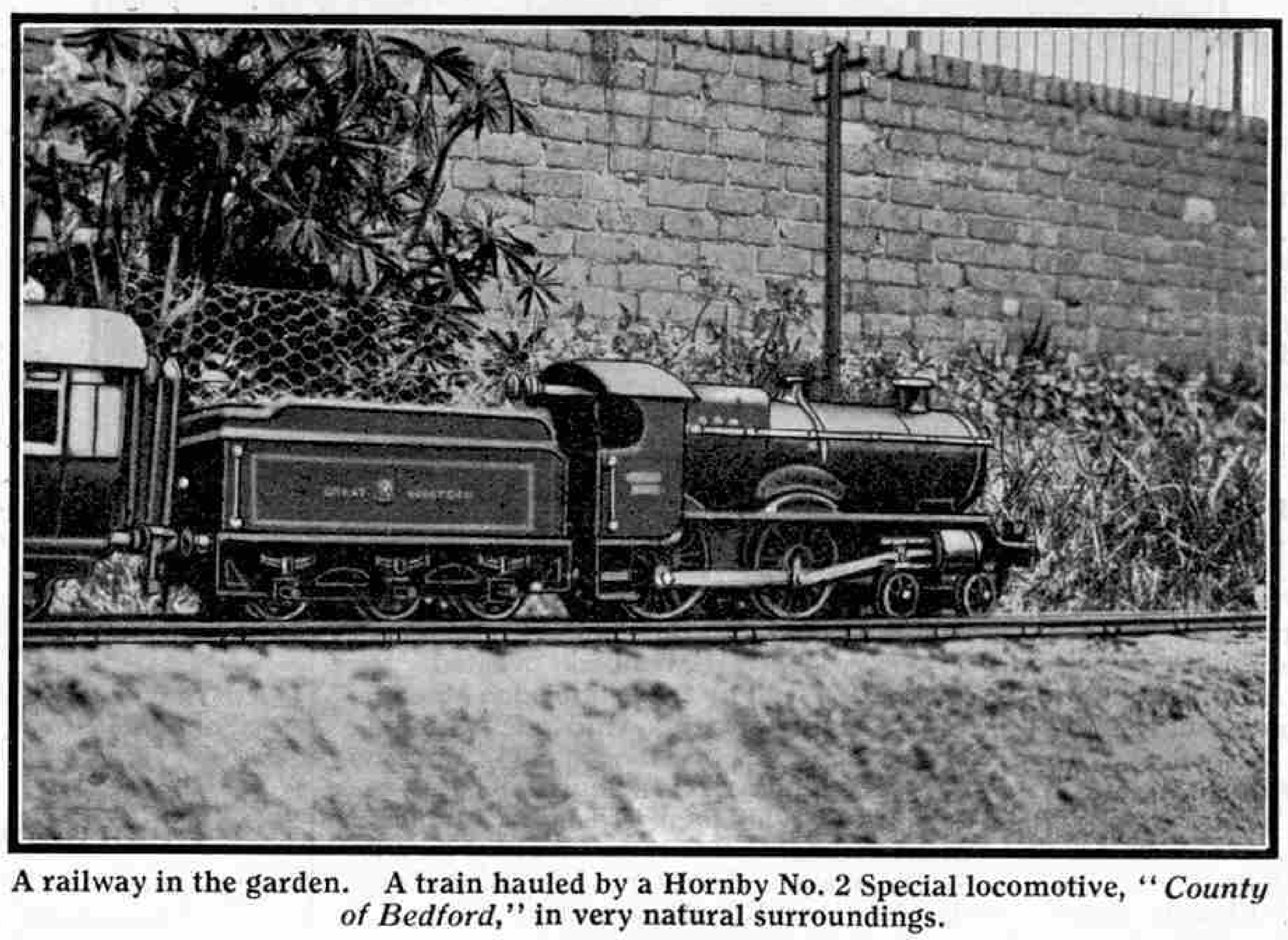
XIX.—Railways in the Garden

MEMBERS OF THE H.R.C. ARE ENTITLED TO WEAR THIS BADGE WHICH IS BEAUTIFULLY ENAMELLED IN COLOURS

IN spite of the bad reputation that our British summers have earned, at this time of the year long sunny days often tempt the enthusiast to take his model railway out of doors. There is no reason why he should not enjoy the sunshine and fresh air without abandoning his hobby, for it is almost as easy to lay down a track on a lawn or stretch of level ground as it is to establish it on a table, or on the shelves that so many Hornby Railway Company members have put up for the purpose. Quite good and healthy fun may be obtained in this manner and there must be very few who are unable to share in it.

Although to move an indoor layout into the garden is an excellent plan, it is even better to lay down a track that is specially adapted for outdoor use. This is by no means difficult, and the variety and pleasure that may be obtained is remarkable, for a railway constructed in this manner may be given surroundings that closely resemble those of real lines.

The first step in establishing an outdoor track is to negotiate for possession of the ground required. This is always advisable, for it would never do to lay rails and build stations in positions where they would interfere with ordinary gardening operations. Neglect of this precaution might end in a railway disaster on a large scale! Fortunately the family autocrat usually is well disposed towards model railway activities.



A railway in the garden. A train hauled by a Hornby No. 2 Special locomotive, "*County of Bedford*," in very natural surroundings.

The choice of ground is very important. The first impulse usually is to make use of the lawn, for its level surface appears to be exactly the place on which to lay down a model railway. But soon longing eyes are cast on neighbouring beds of soil and rough ground. Railway construction on these offers many interesting problems in miniature engineering, and if a rockery is within reach, the joy of the true enthusiast is complete, for then he will be able to plan a railway that travels through territories of all kinds.

The question of permanency is one that must be tackled. With a well-designed scheme there is reluctance to disturb the railway at the end of a day's operations. Unfortunately heavy dew and rain are not good for rails and rolling stock. Even if the rails are of brass they must be carefully watched in order to prevent them from corroding and turning green, and of course, tin-plate rails of the ordinary type are liable to rust.

This difficulty need not prevent an outdoor layout from being constructed, however, The track may be divided into sections, and these screwed down on pieces of three-ply board of suitable size. This also may be done with stations, signal cabins, footbridges and other accessories. The work of lifting or replacing an entire layout arranged in this manner may be carried out in a few moments and the removal need not cause disturbance of other accessories or lineside structures that have been brought into use.

One objection that has been urged to the use of boards in this manner, is that the same layout is in use time after time. There is no reason why alterations should not be made, however, for the work of attaching lengths of track rail to boards is by no means arduous. It also must be remembered that when a good layout has been evolved, it may be a considerable time before the possibilities of interesting working on it are exhausted. It is advisable to consider carefully what layout shall be adopted, however, and in planning it experience gained during the winter months should be very useful.

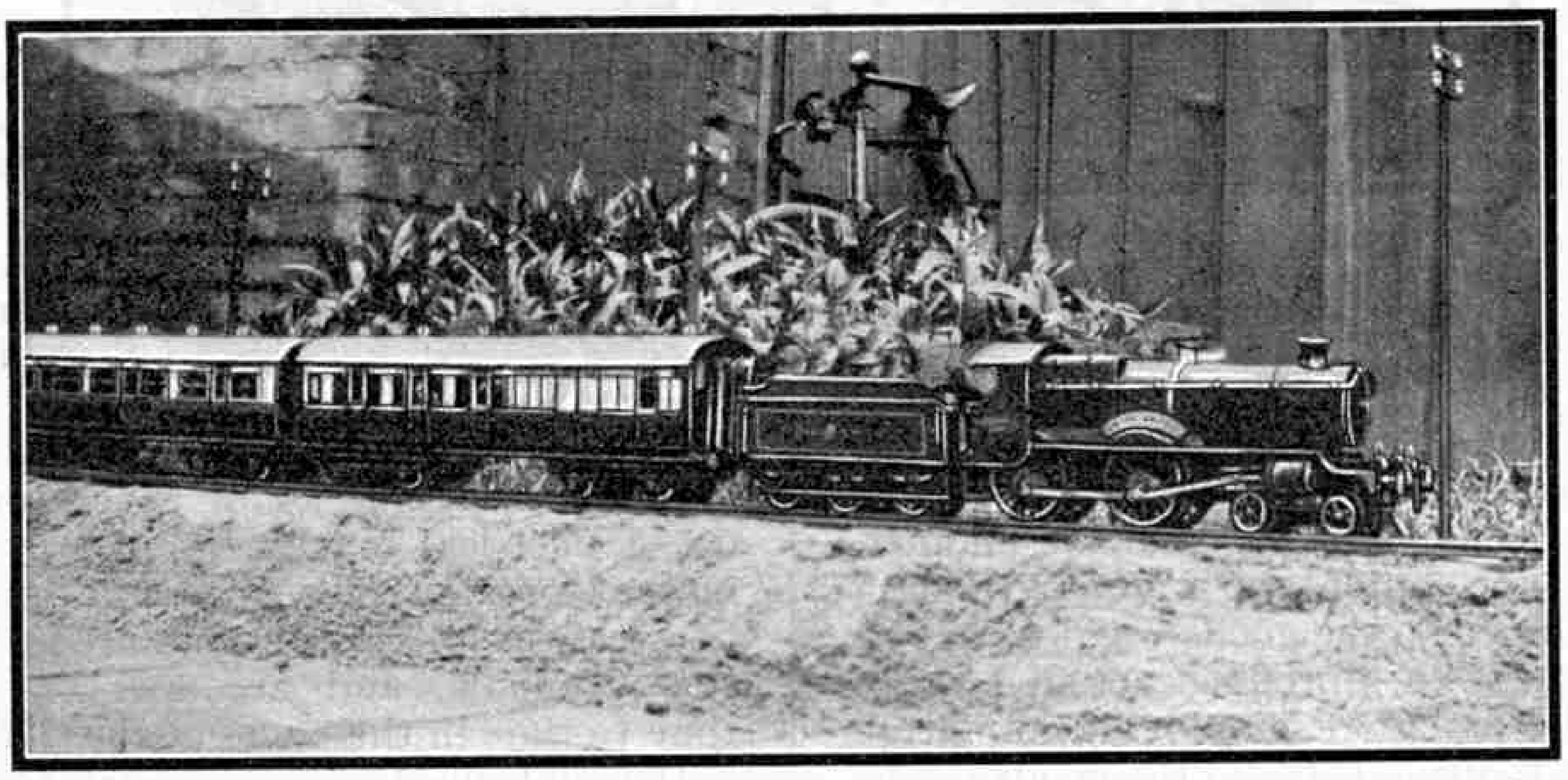
The wood used as a base should be stained, painted dark brown or treated with creosote. This prevents the track from having a raw and crude appearance, and at the same time helps to preserve the wood from any ill-effects that may follow contact with damp ground. The question of ballast also should be carefully considered. The appearance of an outdoor railway is very greatly enhanced by the use of granite chippings or of chicken grit, and if possible a covering of one of these should be used.

Before commencing to lay out a garden railway the ground available for it must be surveyed. If it is intended that the railway shall branch out into "rough country" good exercise in real railway engineering will be obtained. The model railway owner need not take the trouble to find the shortest path, however, or the one that may be worked most economically. Gradients must not be too severe, of course, but the chief thing is to secure picturesqueness and opportunities for interesting running.

Let us see exactly what may be done in different sections of an outdoor railway of the kind we are considering. Naturally the level portion of the layout—presumably that laid on the lawn, or at any rate on grass, would be utilised for stations and lineside buildings of all kinds, for on real railways it is in similar places that most towns and places of importance may be found.

A corner of the Hornby Railway laid down by G. Perrins, Johannesburg. A Pullman train is about to pass a double headed goods train.

As a rule there is more room in which to work than when an indoor layout is being planned and the very best use may be made of available material, whether this consists of railway accessories, including the usual station buildings, signal boxes, engine sheds, or of scenic additions such as miniature trees, fences and farm buildings. Level crossings also may be placed correctly on model railways laid down in the garden, and may be given a very natural appearance by making them parts of miniature roads.


Along an embankment on the garden railway shown in the illustration on the opposite page. The judicious use of telegraph poles helps to give this layout an attractively realistic appearance.

One accessory that should not be overlooked is a telegraph system. Telegraph poles catch the eye very readily, and the use of the representations of these that are included in the Hornby Series help to make a railway look like the real thing. Black cotton may be used to represent the wires themselves.

Although an outdoor railway planned on the above lines is very attractive, it is when the track enters rougher and hillier ground that the real fun begins. In dealing with these the model railway enthusiast has a great advantage over the real railway engineer, for he may make the ground to suit himself, whereas the engineer on a large scale must make the best of the country over which he plans to run a line. To the latter a hill usually is a nuisance, for it may compel him to plan a long detour, or in some other manner may make the work of construction difficult and costly. To the junior model railway owner a hill simply offers a splendid opportunity of excavating a cutting or boring a tunnel that will improve the general appearance of his track! If the ground at his disposal is not as rough or hilly as he would like he may even go to the length of touching it up with a spade.

Cuttings and embankments should be made in true professional style and in particular the amateur civil engineer should take care that he is not inviting landslides by making the slopes too steep. This is especially important when the soil is soft. When thrown out of an excavation this may lie at a natural angle, and it would be as well to reduce this by distributing the soil over a wider area.

An outdoor railway without a tunnel, is of course, quite unthinkable. Fortunately there are many ways of constructing a satisfactory tunnel of sufficient length. A lining is absolutely necessary, for mounds of earth are liable to collapse, and the best form of this undoubtedly is an old drainpipe. Suitable tunnel openings should be placed at each end, and earth piled on top of the pipe in order to hide it from sight. This gives a tunnel through which a train may be dispatched with confidence that it will not be buried as a result of bad engineering methods.

If no drainpipe is available a lining for a tunnel may be constructed of wood. In each case it must be remembered that the board carrying the lines that are used within it must be withdrawn at night and the tunnel must not be placed in an inaccessible position.

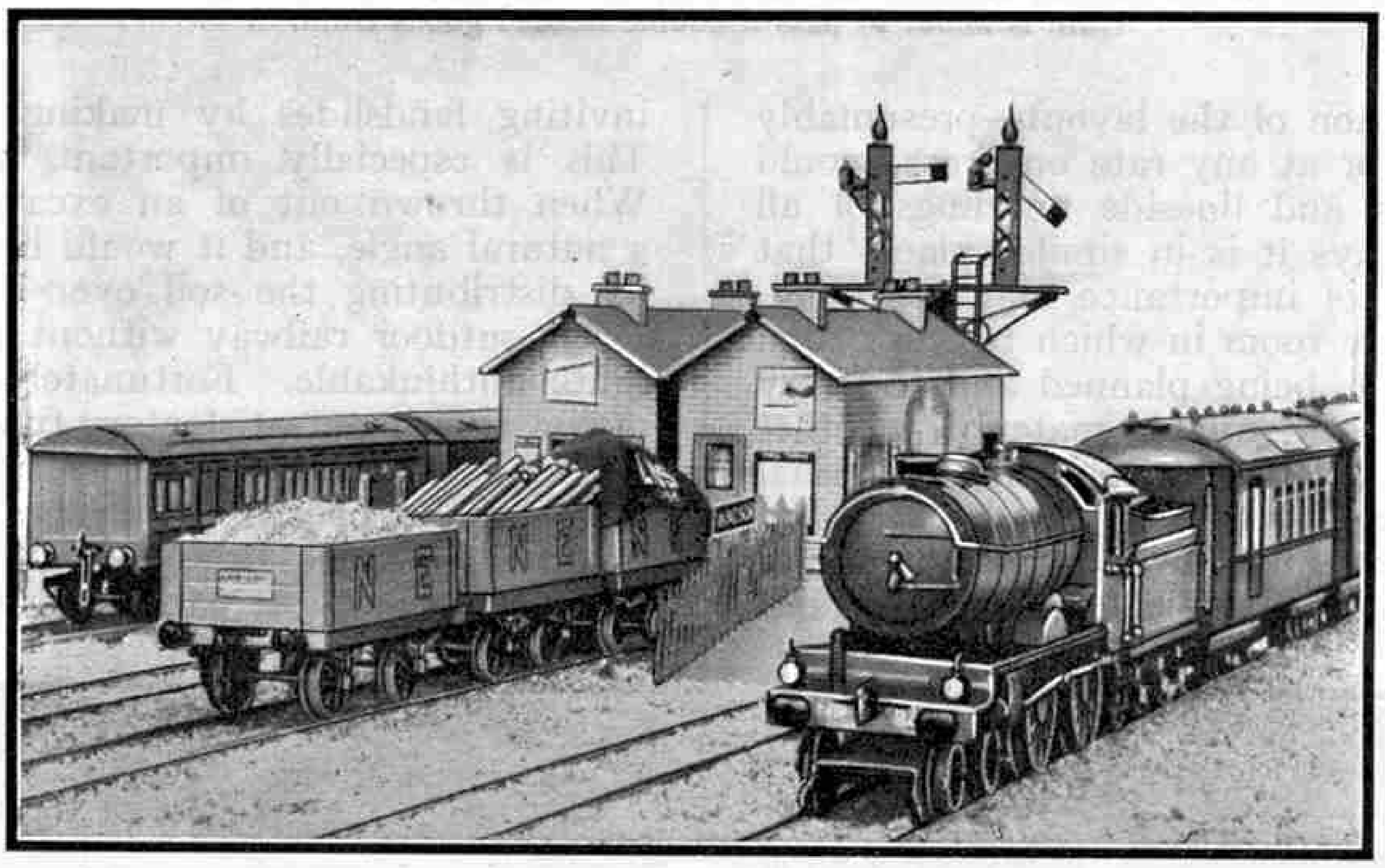
In the cutting approaching the tunnel, retaining walls may be necessary. In their construction short lengths of fairly thick planking may be employed. Vertical strips of thinner wood may be fitted at intervals in order to improve their general appearance, and a length of moulding should be run along the top.

How to get more fun from your Hornby Railway

XXI.—REALISTIC LOADS FOR GOODS TRAINS

THE keen owner of a miniature railway is always striving to extend his layout on the most realistic lines. To do this thoroughly and in an all-round manner may require more time than the enthusiast has at his disposal, and in that case it may be wise to concentrate on one branch of railway operation.

The choice of the direction in which extension may be made depends entirely on the tastes of the owner. To some the prospect of building up a layout resembling in miniature one of our great railway systems makes a special appeal, and on it they run complete series of passenger trains, including crack expresses hauled by replicas of famous locomotives. Another direction that offers great scope for railway work of an intensely realistic character is the running of goods trains, for these provide an astonishing variety both in regard to loads and operation.



The Hornby "*Queen of Scots*" Pullman Express passing a wayside station. In the siding are goods wagons awaiting the arrival of a stopping goods train. They are loaded in the manner described in the accompanying article.

To the enthusiast the running of goods trains is quite as interesting and indeed as exciting as that of crack passenger expresses. This is particularly the case when on his own layout he organises goods traffic in a completely realistic manner. This means that he is not content with merely piling a few miscellaneous articles into the goods wagons that he possesses, but endeavours to reproduce actual railway conditions, even to the extent of employing miniature motor vans and lorries to bring loads to the goods yards, and to remove them from storage warehouses on arrival at their destination. He derives the greatest enjoyment from ensuring return loads for as many wagons as possible—a very important point in real railway working—and in making the loads themselves appear completely realistic.

When we consider the enormous variety of goods that railwaymen are called upon to handle we realise the immense amount of fun that may be obtained by trying to reproduce correct working. Heavy trains are seen composed entirely of open wagons laden with coal, coke, sand, stone and lime among other products. In addition, iron and steel, heavy machinery, bricks, paving stones, chemicals and countless other commodities are carried on our railways, and the term "general merchandise" also covers an immense number of products from crates of china and bicycles to foodstuffs.

Many of these are carried in special vans. For instance, foodstuffs are invariably loaded in closed vehicles of special construction. Similarly heavy engineering products are carried on well wagons, and in many cases are transported under special conditions because they may exceed ordinary loading gauge. The Hornby Series of goods vehicles enables miniature loads of this kind to be transported and enthusiasts will have little difficulty in imitating this aspect of railway work.

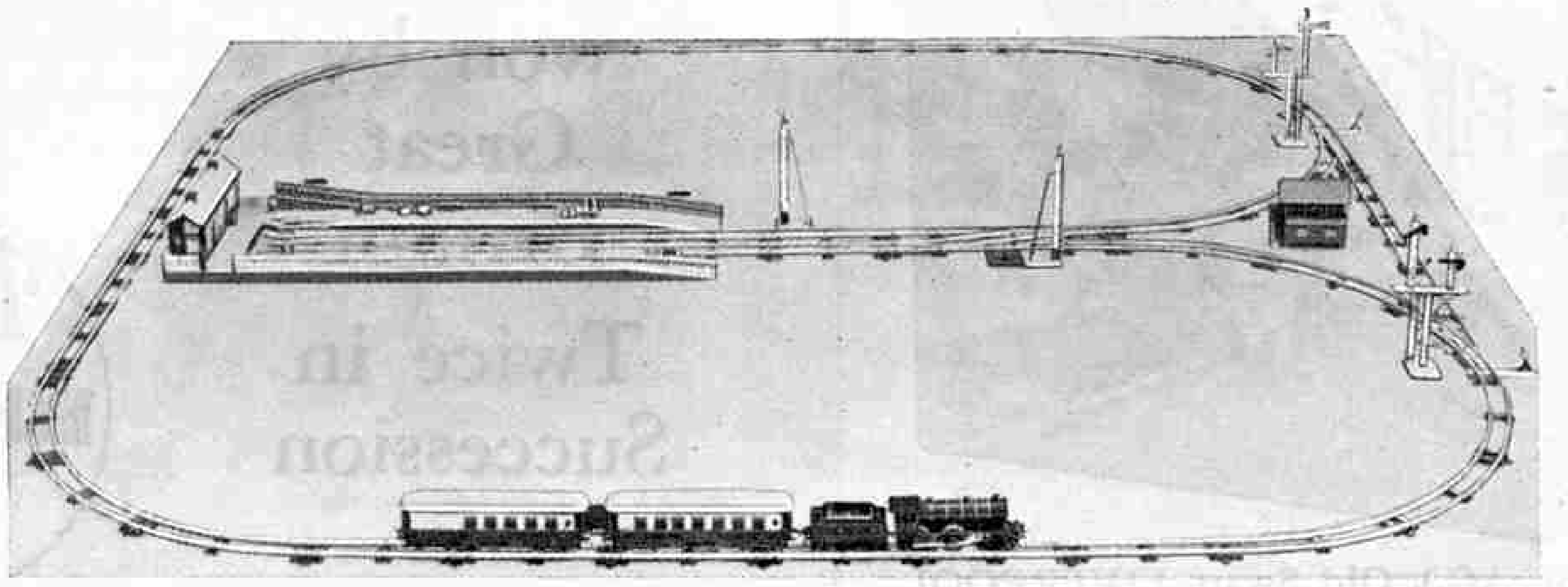
The transport of machinery may be made particularly interesting by employing Meccano models as loads. Very little difficulty should be experienced in building representations of stationary engines, or of generators, transformers and other electrical machinery of size suitable for loading on the Hornby Trolley Wagon. Small models that would be excellent for this purpose are included in the Instruction Manuals, and accounts of others appear from time to time in the pages of the "*M.M.*"

It is not absolutely necessary to make them so small that they may be carried along with other goods. In fact, miniature railway owners who are in search of a little excitement may deliberately build models that slightly exceed the loading gauge of their railways and set themselves the task of transporting them over a section of their layout.

In real railway practice loads of this kind usually are transported on Sundays, when other traffic is at a minimum. The route is carefully chosen in order to ensure the least disturbance possible. When necessary tracks may be moved to one side, or even sunk several inches in order to allow an extraordinary load to negotiate a bridge, and portions of small lineside structures have at times actually been removed in order to give a clear passage.

Splendid opportunities for ingenuity are afforded the enthusiast who sets out to accomplish a similar task on his own track. He is more fortunate than his prototype on real railways, for his lineside structures may more easily be removed, and alterations to the track are carried out more rapidly. One thing that he should avoid, of course, is the mere removal of every bridge, station, or signal post that is in the way, thus leaving a bare track over which almost any load of this character could run without the slightest obstacle. In order to be completely realistic he should deal with every problem on its own merits, in some cases diverting his track, and in others temporarily removing anything that may impede progress.

Princess Elizabeth's Hornby Train



The Hornby Train shown in our photograph is the one the Duke of York accepted on behalf of Princess Elizabeth on the occasion of his visit to the Meccano factory, described on page 546 of this issue. In accepting it the Duke smiled with pleasure and said "She will be greatly delighted."

The provision of loads of other kinds also affords scope for ingenuity and endless variety. Let us suppose that a heavy coal train is to be included among those run over our miniature railway. Of course, it is easy to load open wagons with small pieces of coal, but from a locomotive point of view, the great increase in weight of the train thus brought about is a serious matter.

The difficulty may be overcome quite easily. The best plan is to obtain a piece of cardboard of the same size as the floor of the wagon. To this may be glued other pieces of the same material of suitable shape and size to support the first piece above the wagon bottom in order to form what may be described as a false floor. This should be only a little below the level of the tops of the sides. The same effect may be produced by cutting the card with supporting pieces that fold over inside the wagon.

The false floor should be painted black. When dry it is coated with glue and coal in small pieces spread on it. This simple device gives the appearance of a full wagon of coal without adding appreciably to the weight of the vehicle, and loading a complete train of wagons in this manner gives a very realistic effect. It is an improvement on the plan of simply filling the wagons with coal, in another respect that also, in the event of a derailment, tiny pieces of coal are not scattered over the entire layout, and signs of the disaster may be removed with little difficulty.

The same plan may be adopted in "filling" the tenders of locomotives with coal. Fuel used for this purpose should be broken up into smaller pieces than when loading wagons, and it should be well heaped up, for a generous supply of coal is invariably carried in the tenders. When a small shovel and pricker are placed in correct positions on top the realism is quite complete. The accessories of this character provided with the Watchman's Hut in the Hornby Series are very suitable for this purpose.

Miniature railway owners will have little difficulty in finding ways and means of representing goods of other kinds. For instance, paving stones may be represented by cutting sheets of cardboard to suitable shape and size, and painting them in correct colour. Instead of cardboard, asbestos sheet may be used and slabs of this have a particularly good appearance. As a rule, paving stones are loaded in an upright position and quite a number may be required to fill a Hornby Wagon.

A visit to a railway goods yard when a mixed goods train is being made up will reveal the fact that a large proportion of the merchandise carried on it is packed in crates and cases. These are of various shapes and sizes and no great skill in carpentry is needed to make miniature reproductions of them from thin wood. Ply wood is very useful for this purpose. The boxes should be suitably marked and labelled—most of these to be seen on real railways have the names of their consignors and their destinations plainly marked by means of stencils—and they should be loaded in open wagons, to be covered up during their journey by means of tarpaulins. The miniature tarpaulin sheets now obtained in the Hornby Series enable this practice to be followed closely by Hornby Train owners.

Interesting loads that easily may be imitated include such articles as steel bars, drainpipes and tubes. These may be represented by Meccano Rods. They may be loaded in such a manner that they project slightly over one end of an open wagon, as shown in one of the accompanying illustrations. An excessive number should not be used, for an undue increase of weight would be caused, and care should be taken to place them in such a manner that on curves they do not foul the next wagon.

On real railways we frequently see large tree trunks being transported on bogie wagons. For miniature work pieces of suitable size cut from a thin branch of a tree may be used. These look very effective when secured by chains on Hornby Trolley Wagons. A load of timber is supplied with the Hornby Timber Wagons and the No. 2 Lumber Wagon, and every opportunity of employing these should be taken. Small bundles of straight wood cut from twigs to imitate pit-props also are very useful. These should be loaded in an upright position in open wagons.

In order to add effect to the layout it will be found a good scheme to reserve a small space for the erection of a depôt where pit-props may be stored. These should be stacked in piles of convenient height at suitable lineside points.

A Book for Every Railway Enthusiast

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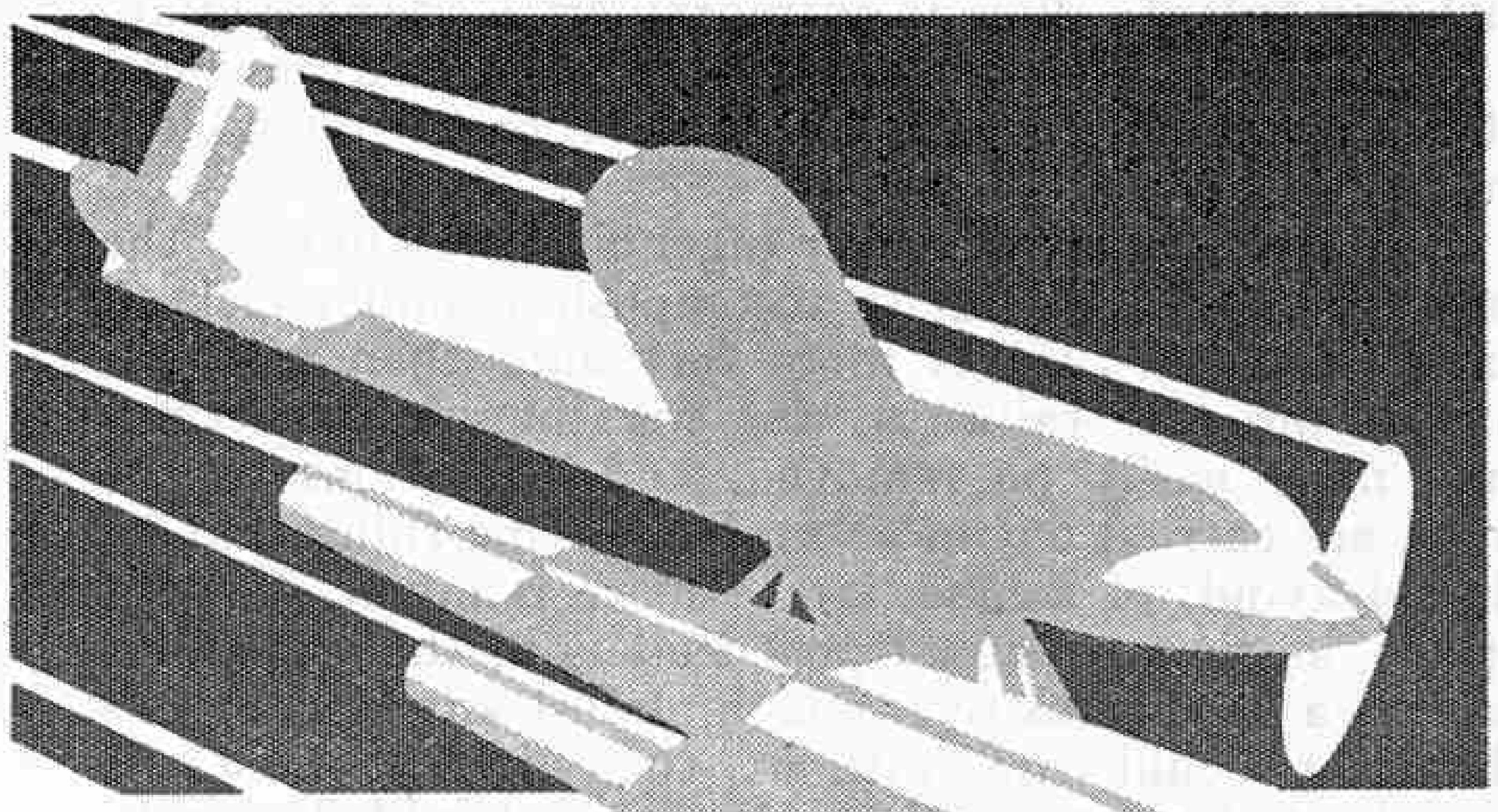

SCHNEIDER TROPHY
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Succession

ON
specially
prepared
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McC 505

Thrills with the Rock Climbers—

(*Continued from page 516*)

was bathed in soft sunlight; Snaefell and the Barules stood out in the Isle of Man, and beyond the North Barule, Sleive Donard in County Down peeped out as though apologising for his intrusion into English scenery. The Cumbrian Hills were so sharply outlined that we were able to define the gullies on St. Sunday Crag, 20 miles away. It was possible to recite the names of 200 peaks.

Over all this the sun began to set, and the three great lakes Wastwater, Windermere and Crummockwater began to appear like masses of beaten gold. The dying day began to light up the sea and the giant arm of the Solway; the mountain peaks commenced to glow, and one great mass of crimson light struck the Pennines. But there is danger on a mountain in the winter dark, and we were forced to leave that wonder-world.

This was the finest experience of nearly a thousand mountain ascents. In the sixteen months during which that view has been a memory I have climbed Gable Mountain over a hundred times, and each time with a hope that I might see the living counterpart of that memory. If I must climb a thousand times in sleet, mist and rain—an unenviable train—before it comes again, I shall not consider the time wasted nor the view too dearly bought.

[Readers of this interesting article will regret to learn that the author, Mr. J. E. B. Wright, recently had his leg broken in an accident that occurred while he was motor-cycling. This misfortune will upset completely Mr. Wright's climbing plans for the summer.—Editor].

Early Days in the Mersey Tunnel—

(*Continued from page 533*)

tipped into a waiting steam lorry beneath, which removes the material for dumping some miles away. This traffic is incessant and I suggest that some mathematical expert might like to work out the number of tons of sandstone excavated during the years in which the process has been going on at Liverpool!

The little electric trucks carry their own power in the form of huge accumulators, which they change at a small charging station on the spot. The entire workings are lighted by electricity, bulbs being mounted on small panels at short intervals. The wan light breaking the misty gloom gives an effect that is very weird, especially in the case of the deeper headings.

It is difficult in the restricted space at my disposal to cover as many aspects of the job as I should like; such for instance as the important process of sealing off water fissures during the early stages. Briefly this was done by cementation, or the high-pressure injection of liquid cement into the cracks, filling them completely, and thus checking water flow. Cementation is an industry in itself with very wide applications. Its value is reflected in achievements all over the country—in sinking pit shafts, in repairing leaking reservoirs, and in such notable cases of fabric preservation as the great work at St. Paul's Cathedral. Similarly I can do no more than mention such items as the plant supplying the compressed air power; the carpenters' and blacksmiths' shops; the elaborate and costly machines used in endless tests to ensure that every part of the undertaking is going through properly; and the whole organisation needed to direct such an enterprise.

I can only hope that I have succeeded in giving some general idea of the beginnings of a very great engineering feat that must have a far-reaching effect upon the trade and transport of the industrial North of England, when its construction has been carried to a successful conclusion.

MECCANO MANUALS

The Meccano Manuals are all beautifully printed and the illustrations are in half-tone throughout. Every Meccano boy should possess a copy of each of the 00-3 and 4-7 Manuals, in which a total number of 846 models is illustrated, and also a copy of the Standard Mechanisms Manual, in which a fine selection of real engineering movements that may be built with Meccano are reproduced. These Manuals may be purchased as separate units, or attractively bound in full cloth cover, lettered in gold.

The prices of the full range of Meccano Manuals are as follows:—

No. 0 Manual of Instructions	Price 6d.
No. 00-3 " "	" 1/6
No. 4-7 " "	" 1/6
Standard Mechanisms Manual	" 1/-
Bound Manual of Instructions ...	" 7/6

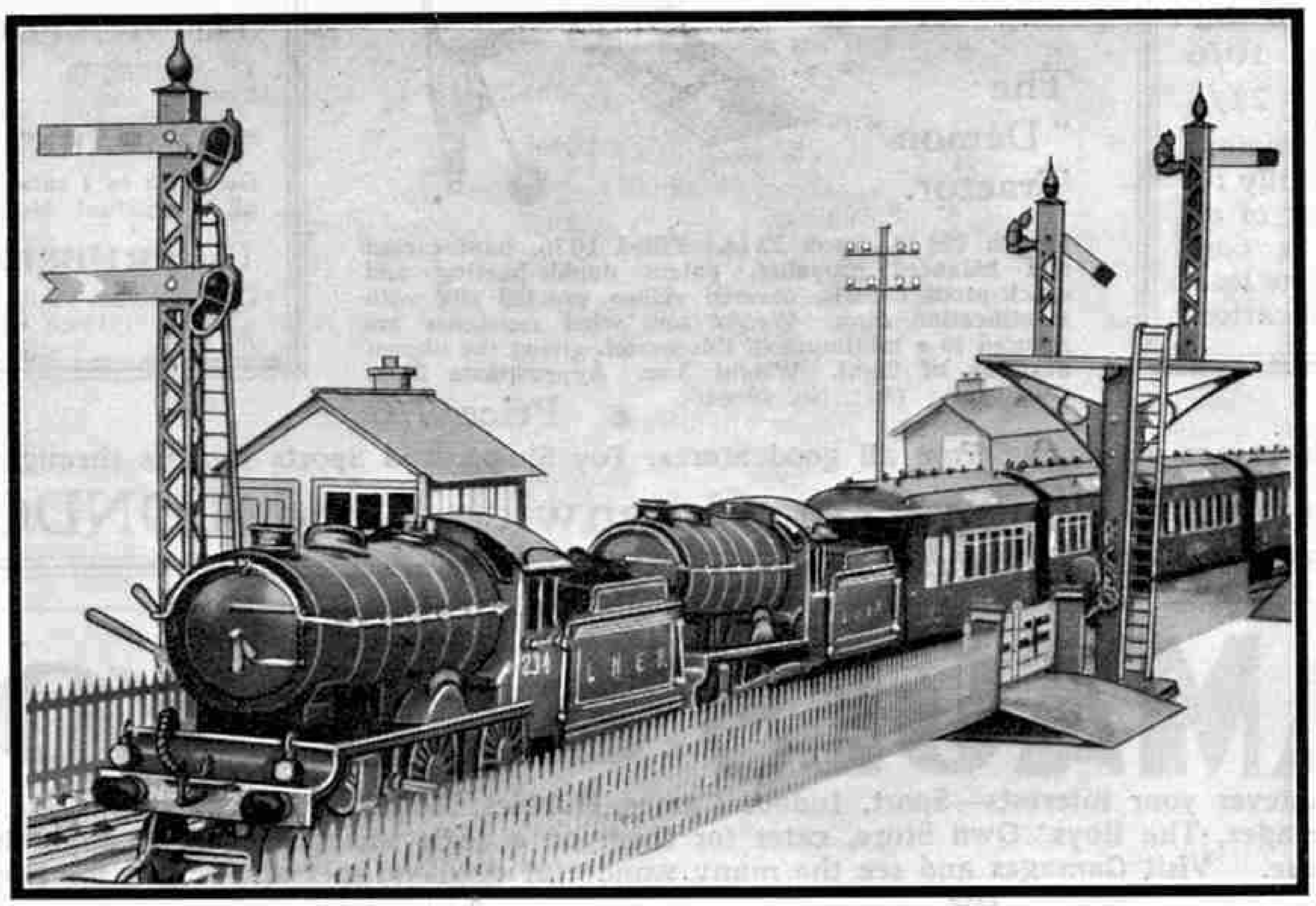
Meccano Ltd., Binns Road, Old Swan, Liverpool.

Signals in the Hornby Series

By "Tommy Dodd"

THE average Hornby Train owner is thoroughly familiar with the use of most forms of signals.

For instance, he knows the difference between a "home" and "distant" signal, the latter being distinguished by the fishtail shape of the end of the arm. He does not get unduly alarmed, as occasionally his elders do, if a train runs past a "distant" signal, for he knows that this merely issues a warning to the driver telling him that the "home" signal—the one nearest the signal box—is at danger. Under these circumstances the driver may pass the "distant" signal, which is placed sufficiently far away to enable him to come to a stop on reaching the "home" signal if this is still against him.



A heavy Pullman express, headed by two Hornby No. 2 Special locomotives of the "Shire" Class. The Junction Signal shows that the express is to be diverted to a branch or loop line on the right.

One use of signals that occasionally puzzles the Junior railway enthusiast appears to him to be a contradiction of this practice. A "home" signal may be seen to give right of way to an approaching train, while a "distant" signal fitted to the same post stands at danger. "Home" and "distant" signals mounted on the same post are interlocked in order that the "distant" cannot show "all clear" if the "home" signal is at danger, such a combination naturally being used in short sections of the track, where it is impossible to place the "distant" signal sufficiently far ahead. To see a "home" signal down while a "distant" signal is still up therefore may appear somewhat remarkable.

The solution to this little problem is simply that in such a case the "distant" signal refers not to the "home" signal alongside, but to the following one, warning drivers that they may expect to find this at danger. Control of a "distant" signal so placed rests with the signalman in the next cabin.

All these positions may be reproduced by means of signals included in the Hornby series. The use of the ordinary single arm signal requires no comment, but I may remind members of the H.R.C. that both "home" and "distant" signals are available. On a miniature layout, space is not always available for placing the "distant" before the "home" signal, and for this reason posts carrying arms of both kinds are available. These may be used in exactly the same manner as on real railways, and their employment offers good opportunities for interesting signalling work of the kind I have indicated.

When layouts become more complicated signals of a different type are required. For instance, when a line branches away from the main track two signals are necessary, one to give right of way along each road. Usually the arms are mounted on short posts erected side by side at the top of a longer one, and each signal applies to the road on its own side. Following correct practice the Hornby junction signal is made with one post higher than the other. The arm on the taller of the two posts usually is taken to apply to the more important of the two lines, the lower signal therefore controlling the branch line.

When a more complicated miniature railway is laid down the number of signals required at one point naturally becomes greater, and in order to be of service at places on the layout where there are several tracks the Hornby gantry signal has been introduced. As most H.R.C. members no doubt are aware it provides the necessary signalling arrangements for a track with four roads, two up and two down, and there is little difficulty in deciding to which of the roads the signals on it shall refer. The employment of a signal gantry spanning the track enables a driver to "pick up" easily the signal applying to the road for which his train is destined, and the Hornby gantry signal is a very realistic reproduction in miniature of those employed on real railways.

One signal appliance that often is the cause of questions from beginners is the "Tommy Dodd," a name in which, of course, I am specially interested! This small signal is not nearly so imposing as the enormous gantries seen at a number of railway termini and junctions, but nevertheless it performs a very useful service. It is the ground signal that shows whether the points leading to a siding are open or closed. When the siding cannot be entered, the signal shows a red face or arm by day, and of course, at night a lamp mounted on it gives a red glow. When the points are set to enable a train to be diverted into the siding the signal is moved in order to show a green face or a green light. "Tommy Dodds" are only about 3 ft. 6 in. in height, and as they are usually at the entrances to goods sidings they may easily be overlooked by ordinary railway travellers. They only control movements through crossovers and points that are laid in a trailing direction to the main lines.

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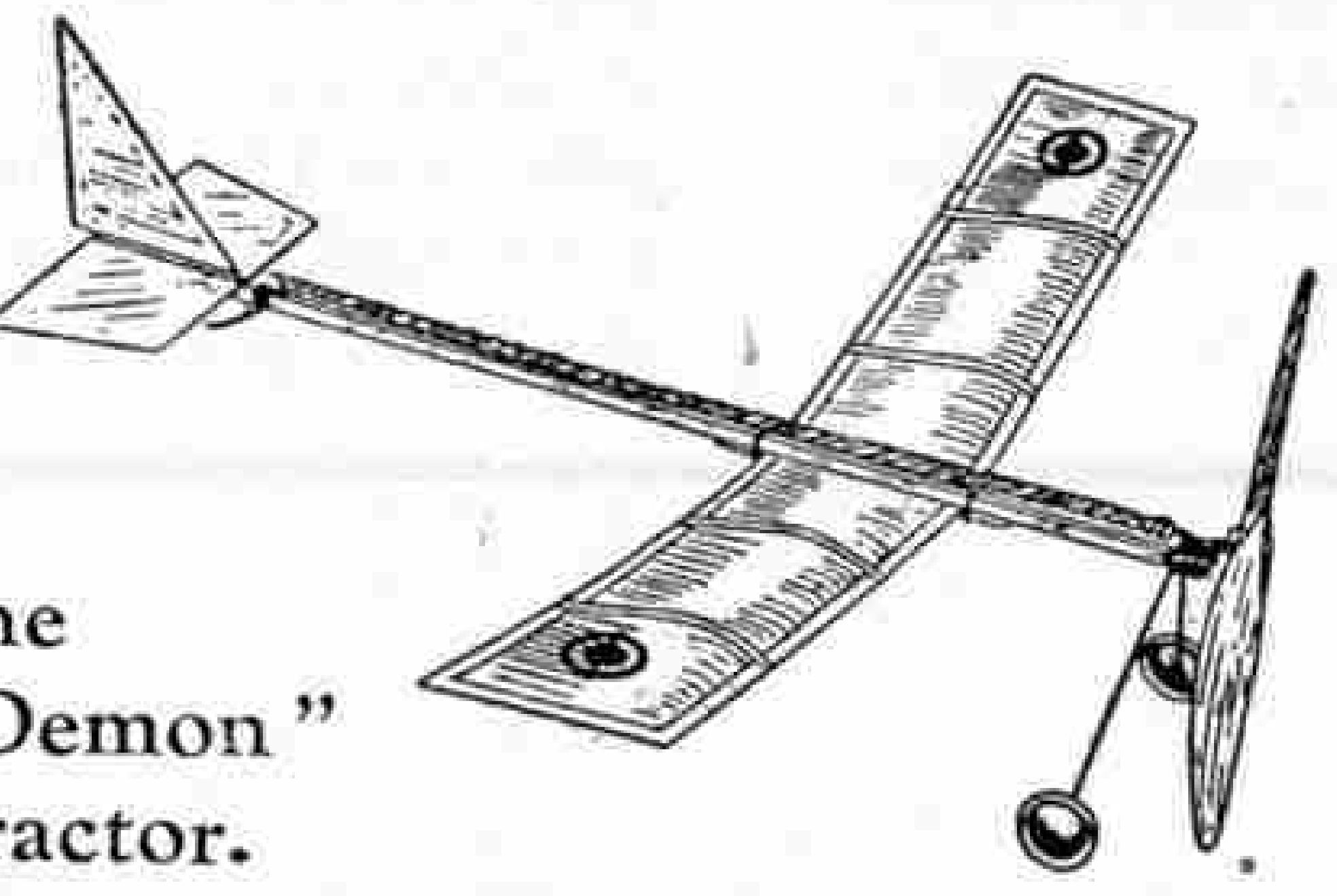

The "Demon" Tractor.

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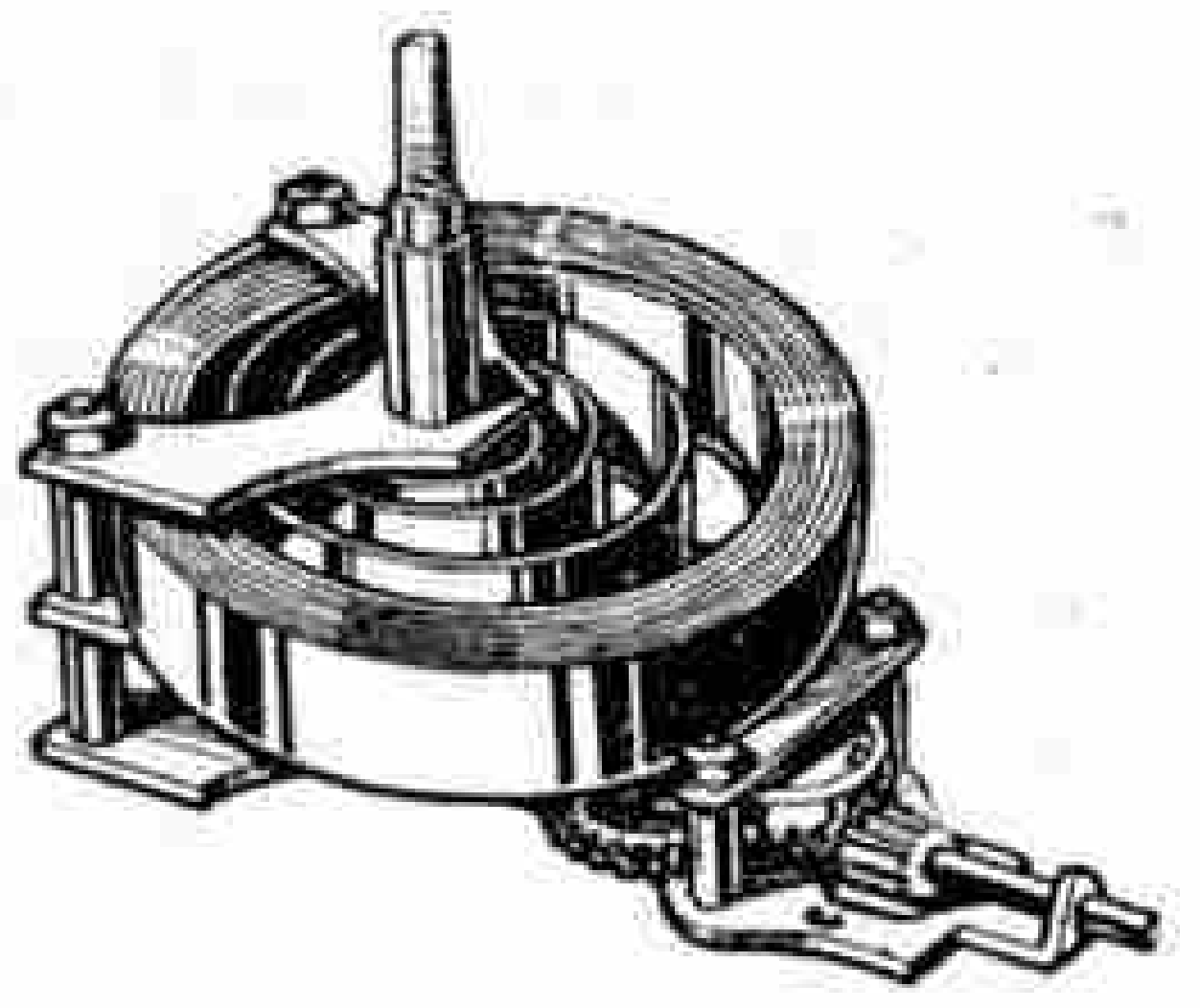

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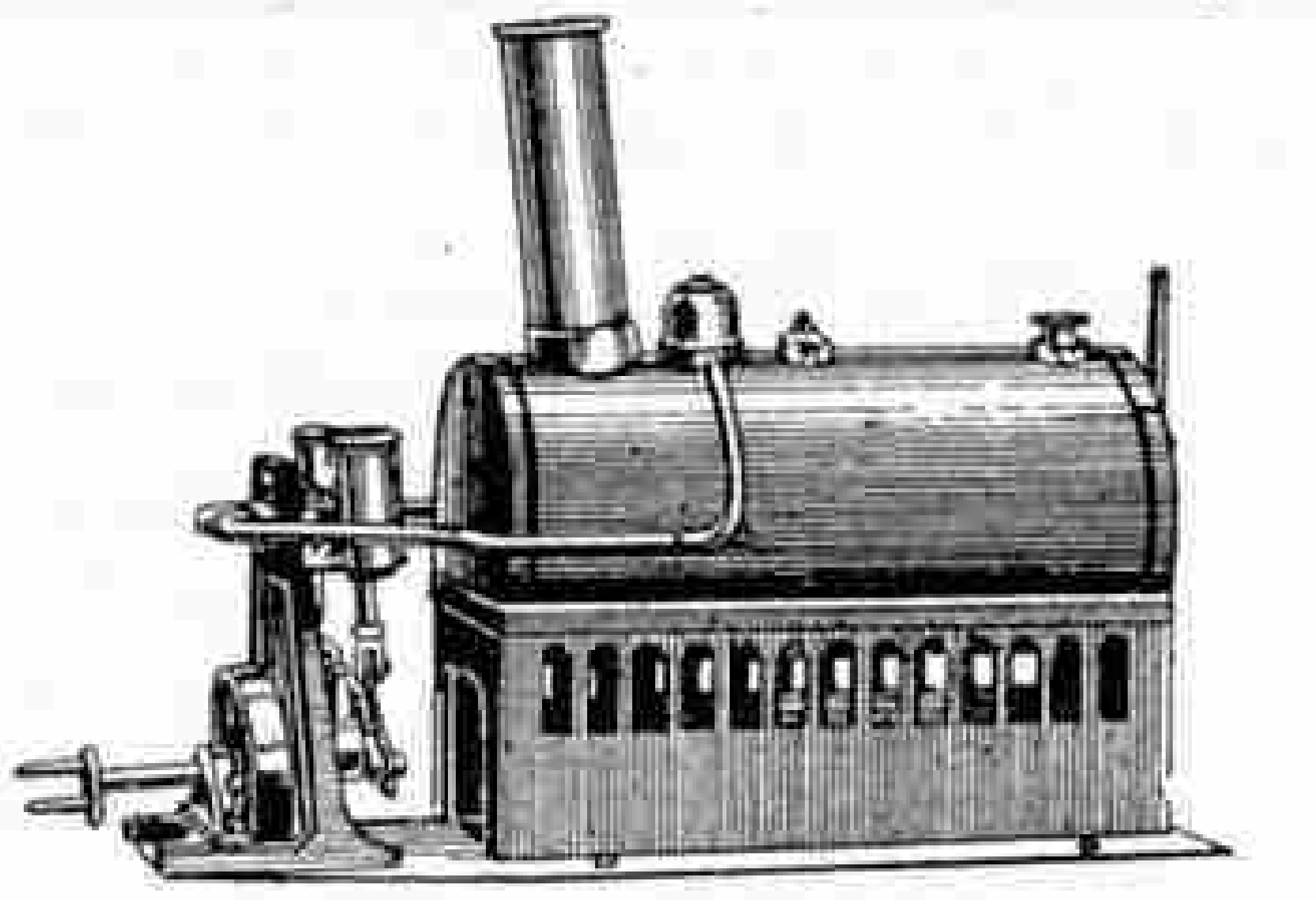

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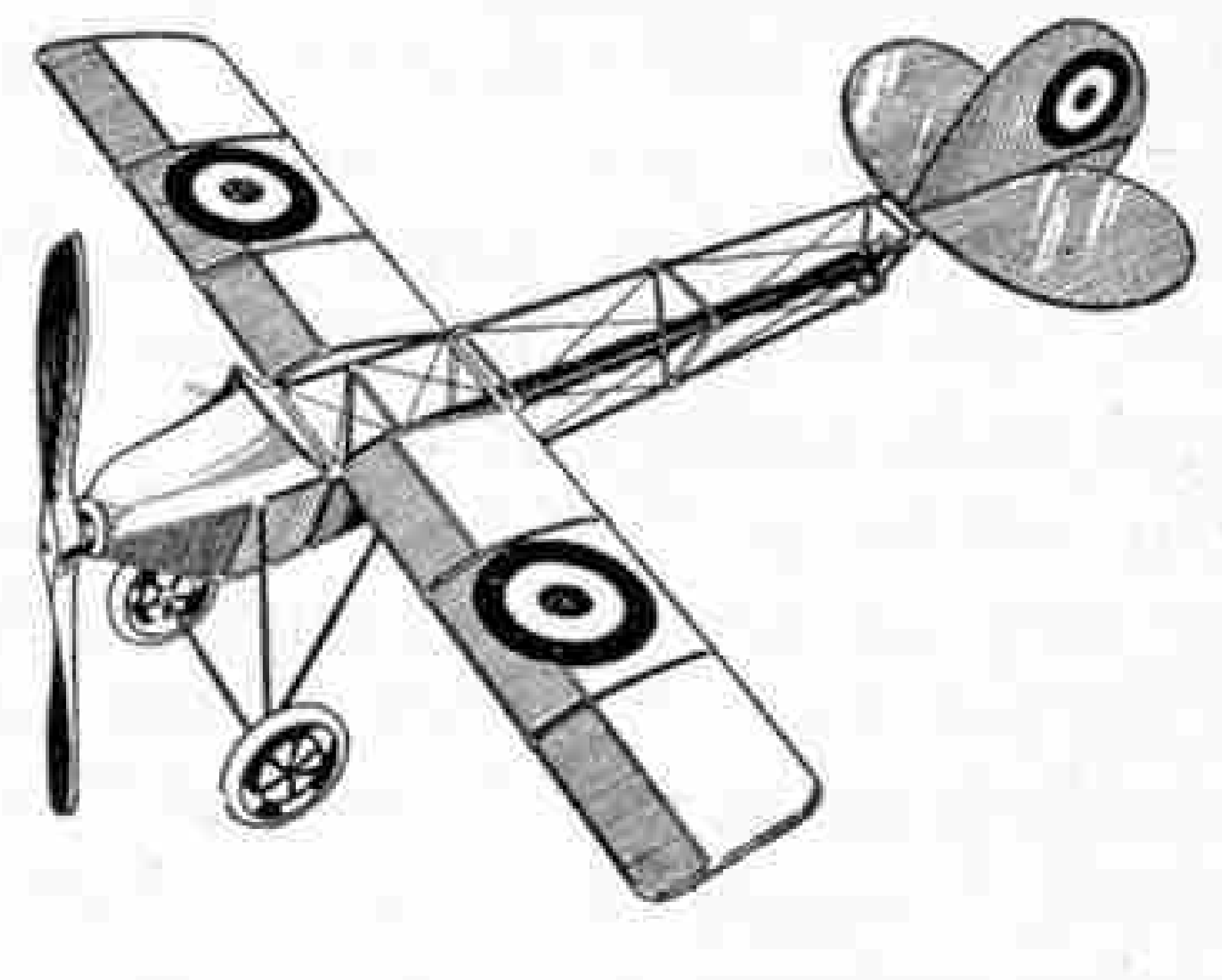

An exceptionally fine new Model. Constructed of highly tempered steel wire and proofed silk fabric with cambered wings and enclosed cockpit. Fitted with rubber tyred landing wheels. This machine is practically unbreakable. Wings, tail and landing wheels can be detached. Wing span 19 in.

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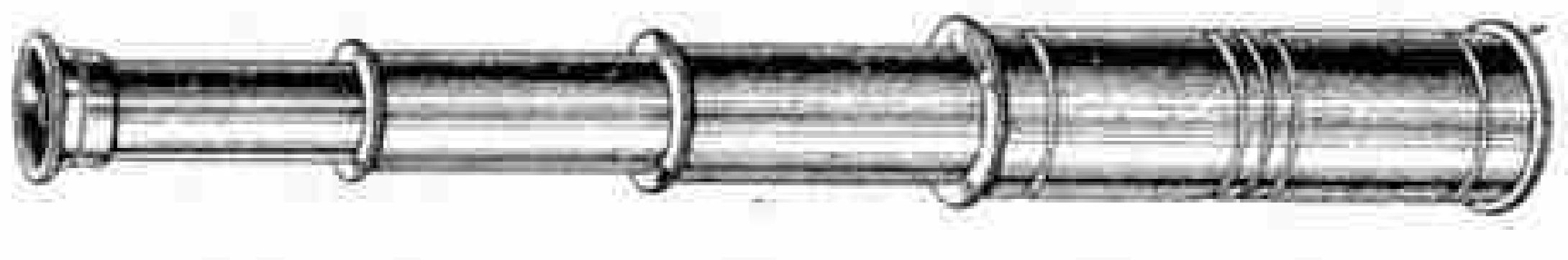

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H.R.C. COMPETITION PAGE

Competitions appearing on this page are open only to members of the Hornby Railway Company. Envelopes containing entries should have the title of the competition clearly written in the top left hand corner and should be addressed to the Hornby Railway Company, Binns Road, Old Swan, Liverpool. The name, address and membership number of each competitor should appear in clear writing on every sheet of paper used.

A New Missing Links Contest

SERIOUS trouble has arisen in a large Branch of the Hornby Railway Company. During recent track operations a member named Smith was stationed in charge of a section of the Branch layout that was supposed to be in the open country, his special task being to guard a level crossing.

For a short time Smith performed his duties admirably, allowing vehicles to cross the line at the right moment and taking care that a clear passage was given to trains, although at times he showed a tendency to lapse into a brown study. Towards the end of operations, however, the members were suddenly horrified to find that the gates were closed against the most famous of British expresses, and that a farm cart drawn by a particularly quiet and ancient horse was standing right in the path of the oncoming express.

Looking round for the man in charge they saw that Smith had retired from the crossing and was concentrating his attention on a rather dirty scrap of paper. They shouted to him and an engine whistle sounded furiously. With a start Smith came back to reality, dropped the piece of paper and rushed to clear the line for the express.

Alas, he was too late! In his confusion he tried to back the horse and cart out of the way instead of giving the animal a smart lash in order to cause it to rush forward, and before the obstacles could be removed in order to allow him to open the gates the express dashed into them. The horse was killed, the cart was smashed and the train itself derailed!

Consternation reigned among the members of the Branch when they saw their beautiful Pullman coaches lying overturned by the side of the line, and the locomotive—a No. 2 Special, the pride of the Branch—overturned and jammed into a heap of wreckage. Needless to say, the erring member was immediately arrested, and placed on trial on the charge of neglect of duty.

A member of the Branch undertook to act as counsel for the defence, although he felt that there was no excuse for the prisoner's conduct. Suddenly he remembered the piece of paper. Dashing to the other end of the room he soon discovered it and after studying it for a few moments decided that it must be produced at the trial.

We need not enter into the details of the trial. The prosecutor explained the circumstances, and members immediately concerned gave their evidence, with the result that things looked very black for the prisoner. Finally defending counsel rose to make his speech. He fully admitted the terrible character of the offence, but pleaded that there were extenuating circumstances and in confirmation produced the piece of paper that Smith had been studying. This was now seen for the first time by the judge and members of the jury, and is reproduced in the panel in the centre of the page.

Counsel explained that defendant had been trying to find the missing links in the words incompletely reproduced on the paper. These represent the names of famous locomotives and their designers and give also the railway works at which they were built. It was at once agreed that the erring member was not so black as the prosecution had painted him, and great interest was shown in the puzzle he was trying to solve.

–o–le–t	S–r G–l– –rt C–a–g–to–	–win–o–
B–ll–n–on	–a–rp–il–y –a–t–e	–a– –in–to–
–owe– Co– –e	Ad–e–le– –a–l	–re–e
–ob–n–o–	–e–em–ra– –e	–ow– –ir–
–hu–ch–ard	G–o–g– –h– –if– –	Go–to–
B–we– – –oke	–a–o–r	–wi– –on
R–ve–	–o–n–y –f –e–fo– –	–r–g–to–
–ha–e	C– –y –f –e–ca–t–e	S–ind– –
Co– –e– –	–e–s–ead	C–e–e
–e–d	–o–d –el–o–	–on–as–er
M–u–se – –	– –peri– –nt	E–st–e– –h
–r–s–ey	–i– –a–te– –co– –	–r–we

The Chairman played up to his part as judge by announcing that the solution to the first line was "Collet—Sir Gilbert Claughton—Swindon." The foreman of the jury said that was all wrong. This led to a wrangle, and in the end, judge, jury, counsel, and in fact, everybody in court became so keen on working out a correct list that prisoner was forgotten and left the dock without being sentenced.

We pass the puzzle over to members of the H.R.C., with the warning that the names have been mixed up and must be sorted out. For instance, the remnant of the name of a locomotive that appears in the second line suggests one of the G.W.R. "Castles," but these certainly were not built at any place from the name of which the incomplete word "–a– –in–to–" could be obtained!

It will be seen that in the first column are given the names of the designers of the famous locomotives named in the second. In the third column appear the names of well-known railway locomotive works at which these engines have been constructed, all names being incomplete.

Readers should copy out the list neatly, endeavouring to fill in the necessary letters, and arrange the names in correct order. When they have done this to their satisfaction they should enclose the list in an envelope marked "Missing Links" Competition, and post it to H.R.C. Headquarters, Binns Road, Old Swan, Liverpool.

The competition will be divided as usual into two sections "Home" and "Overseas." In each of these the sender of the solution that is most nearly correct will be awarded a prize of Hornby Train goods (or Meccano products, if preferred) to the value of 21/–. For the three entries in each section that are next in order of merit, similar prizes of value 15/–, 10/6 and 5/– respectively will be given. A number of consolation prizes also will be awarded, and in the event of a tie neatness and originality in presentation will be taken into account in awarding the prizes.

Each competitor must give his H.R.C. number and entries should be posted to reach Headquarters on or before the 31st July. The closing date for Overseas competitors is 31st October, 1930.

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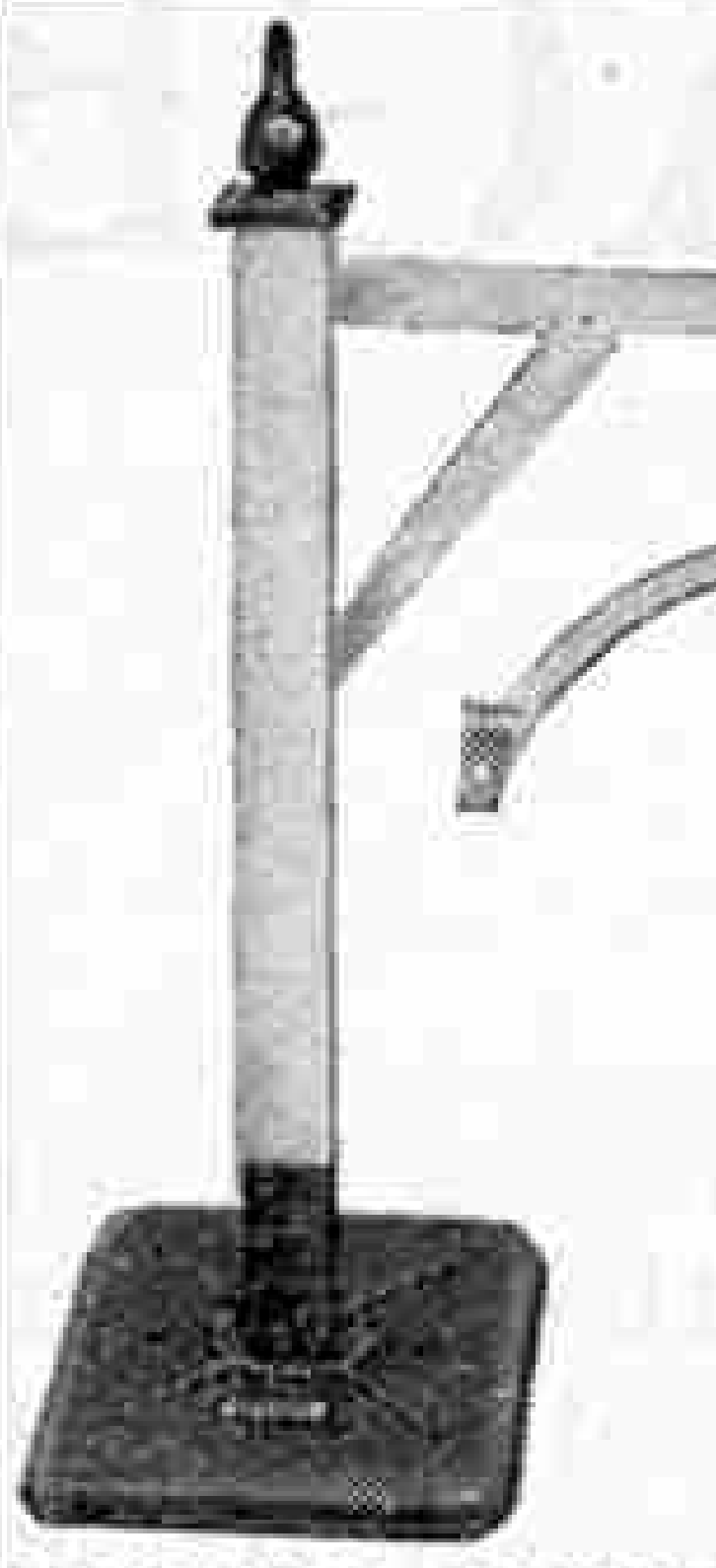
HORNBY ACCESSORIES

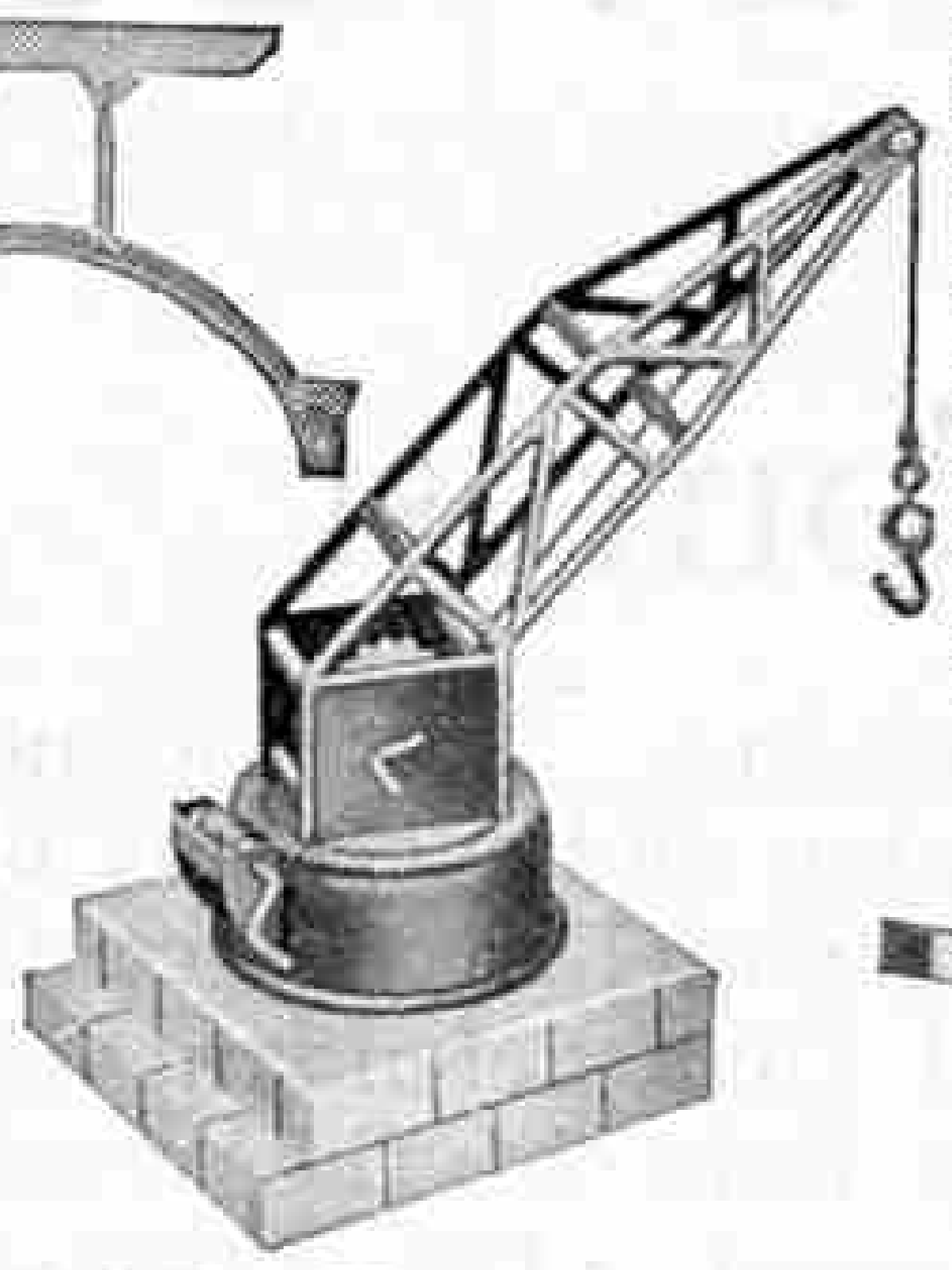
HORNBY SERIES

There is a splendid range of Railway Accessories in the Hornby Series, built in perfect proportion and beautifully finished. With these realistic Accessories the most elaborate model railway system may be constructed and operated in exactly the same manner as a real railway.

A selection of Hornby Accessories is illustrated below. Your dealer will be pleased to show you the full range.



LOADING GAUGE
Price 2/3



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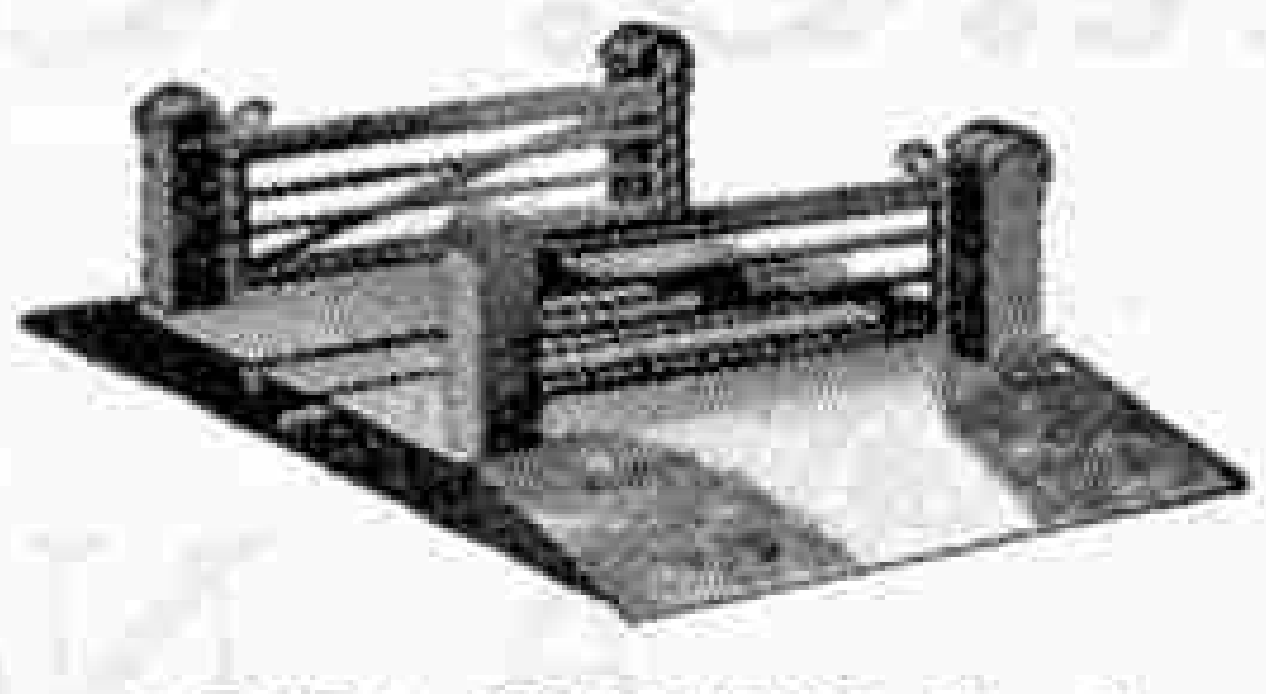
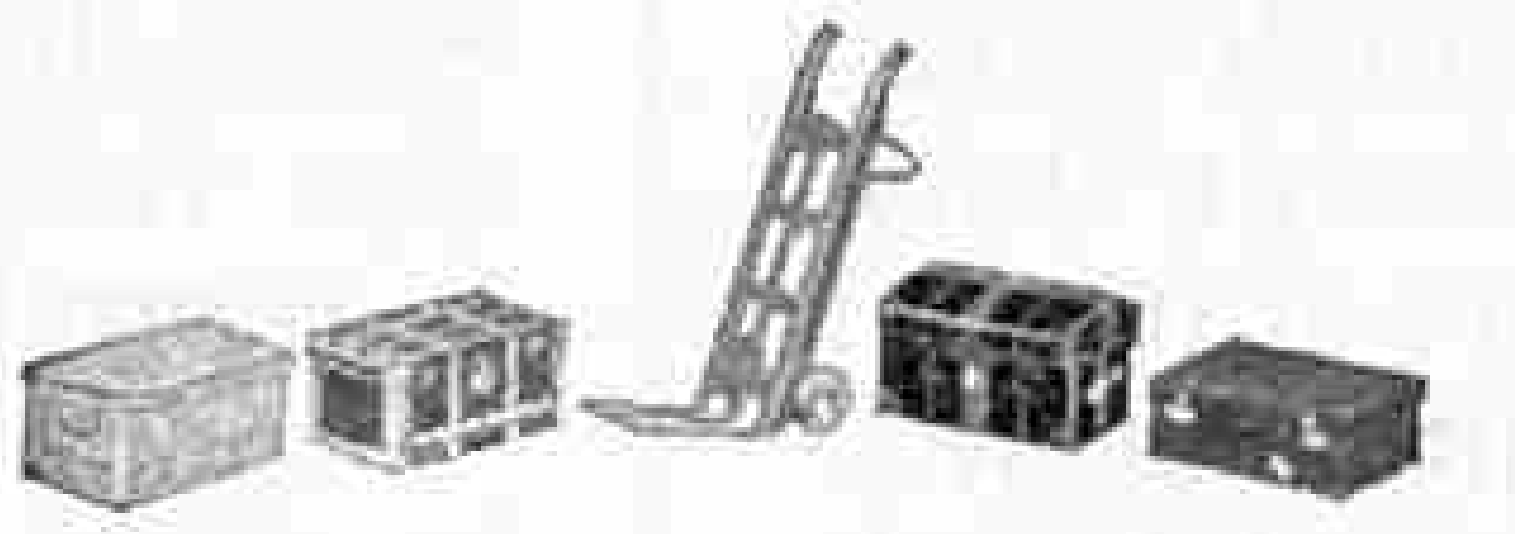


LEVEL CROSSING No. 1
This model is realistic in appearance and beautifully enamelled in colours. It is suitable for a single track only and has gauge 0 rails in position. Price 3/6

SIGNAL No. 2
Price 2/6 each. "Home" or "Distant."



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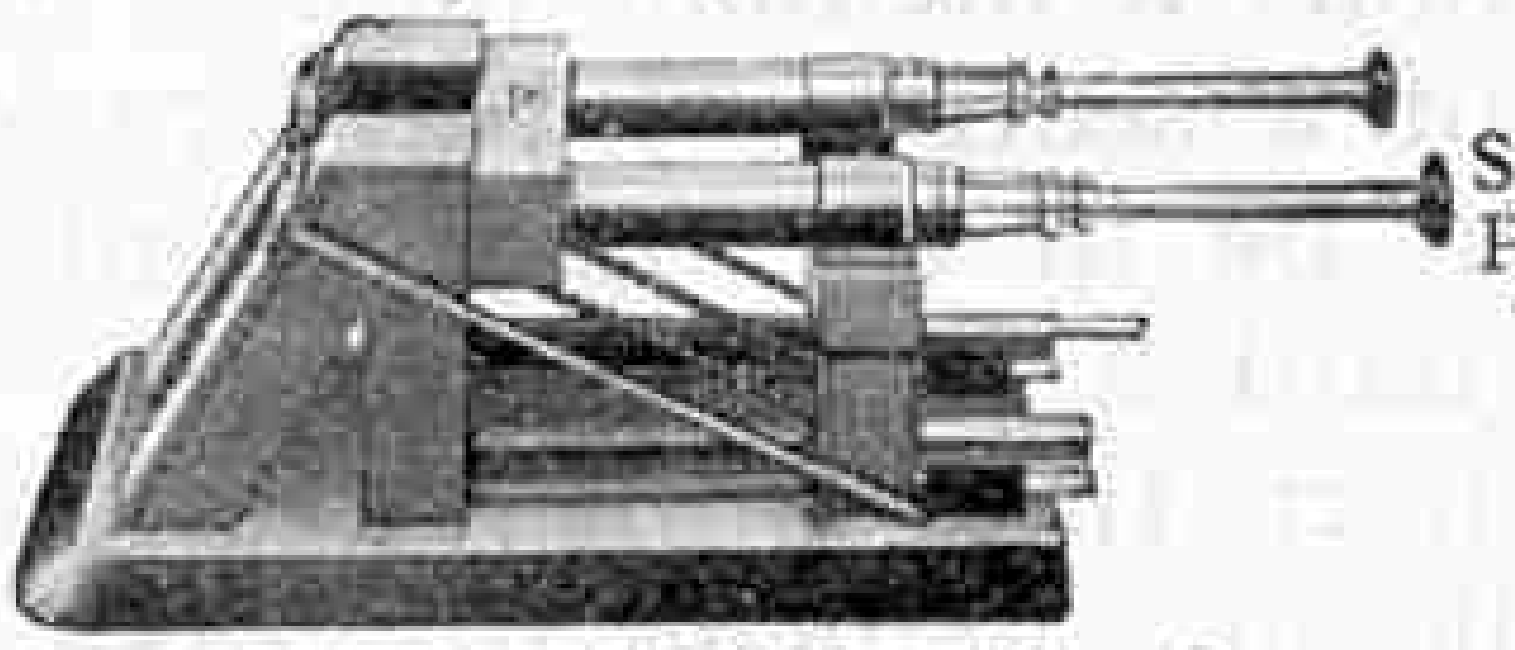

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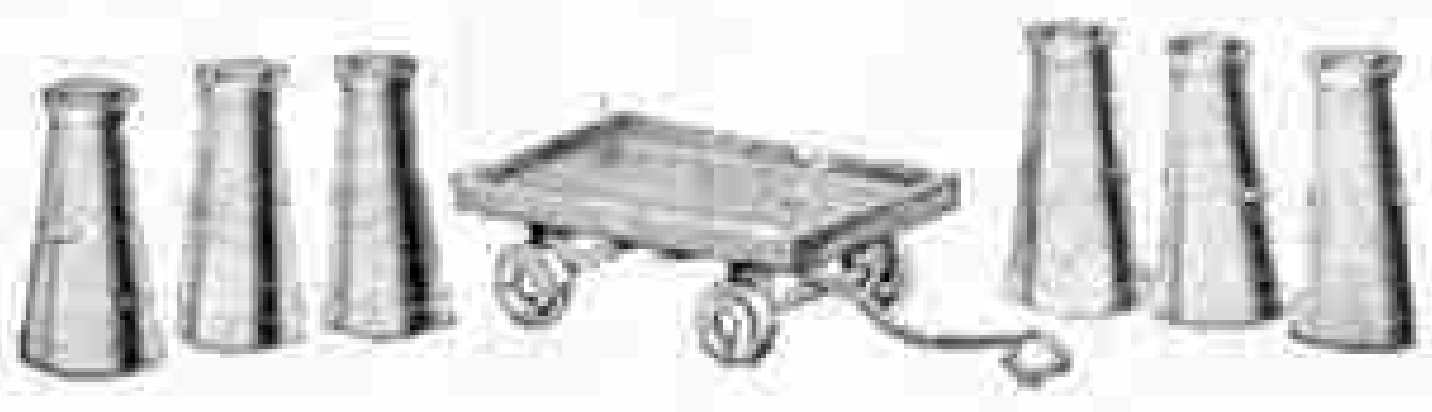

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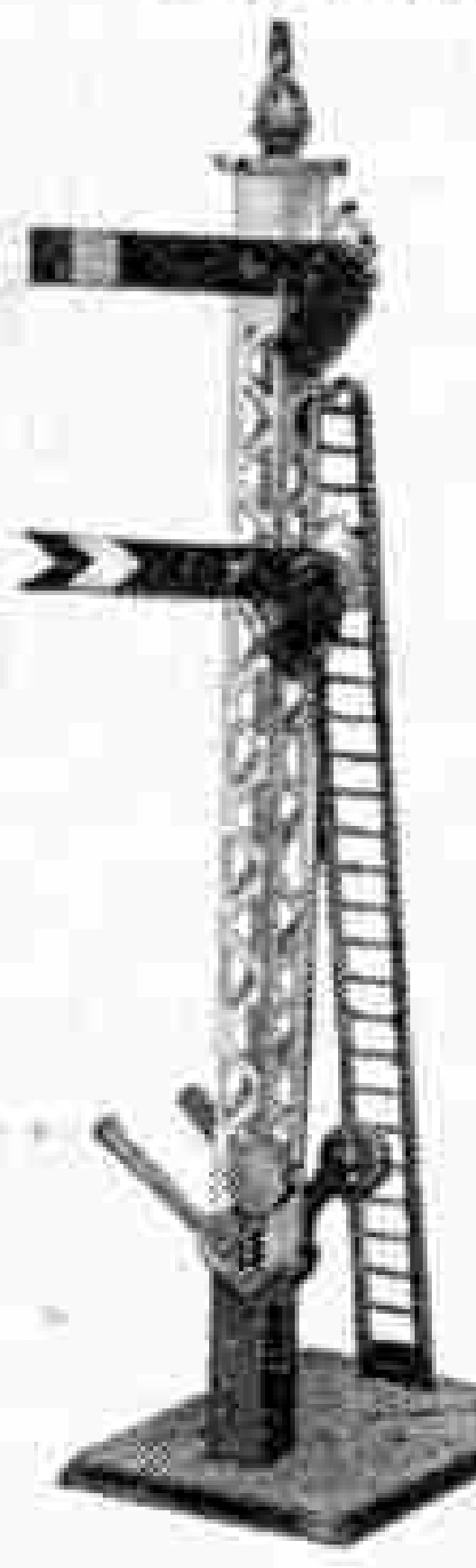

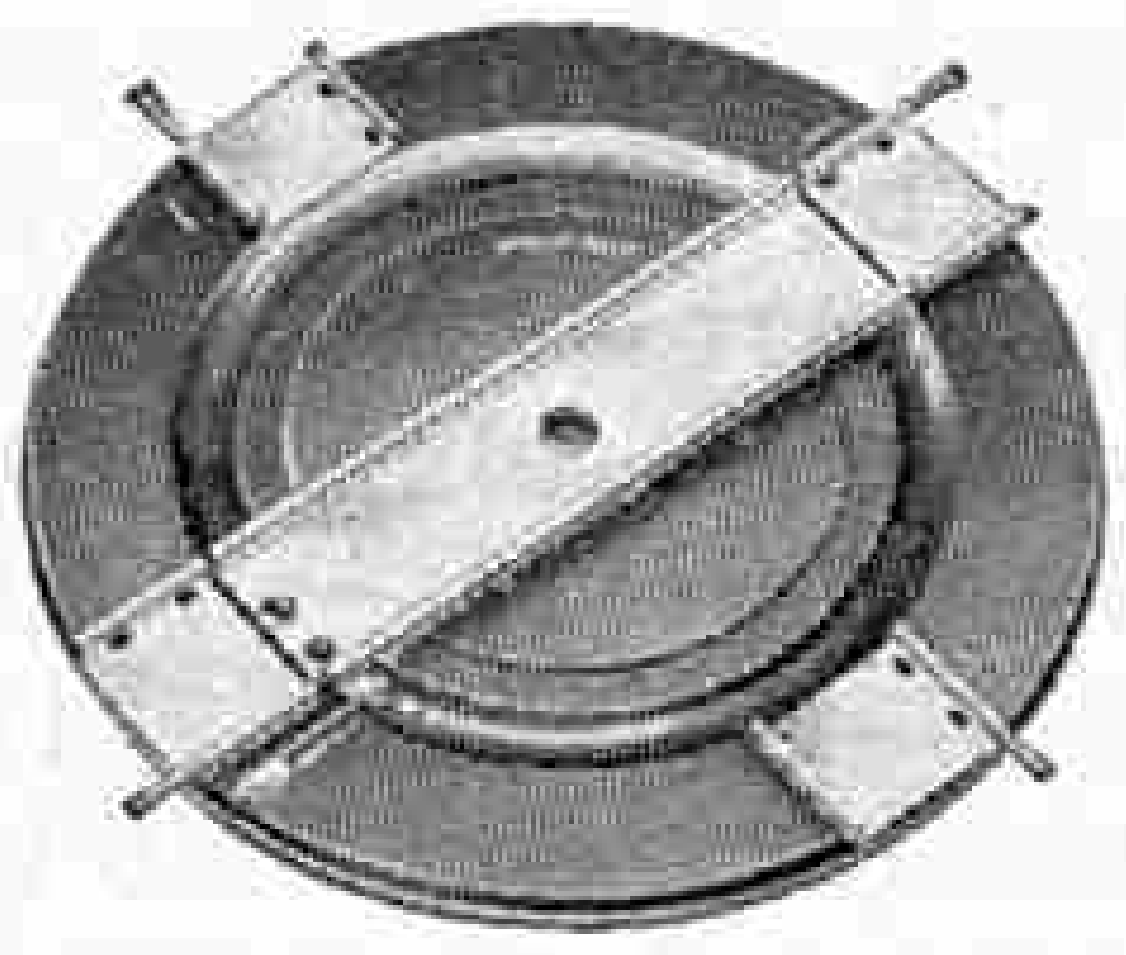

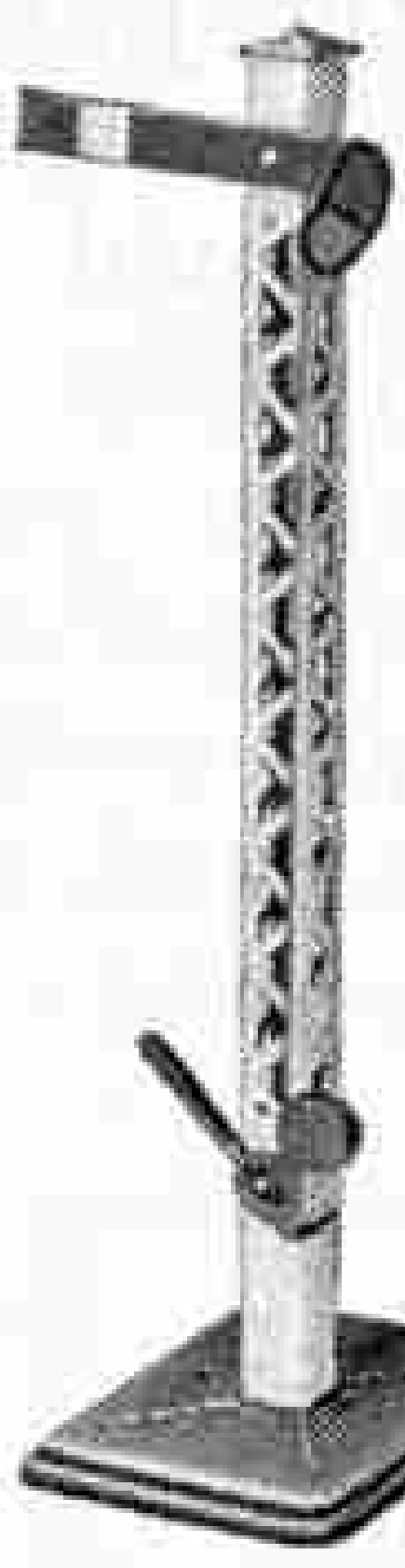

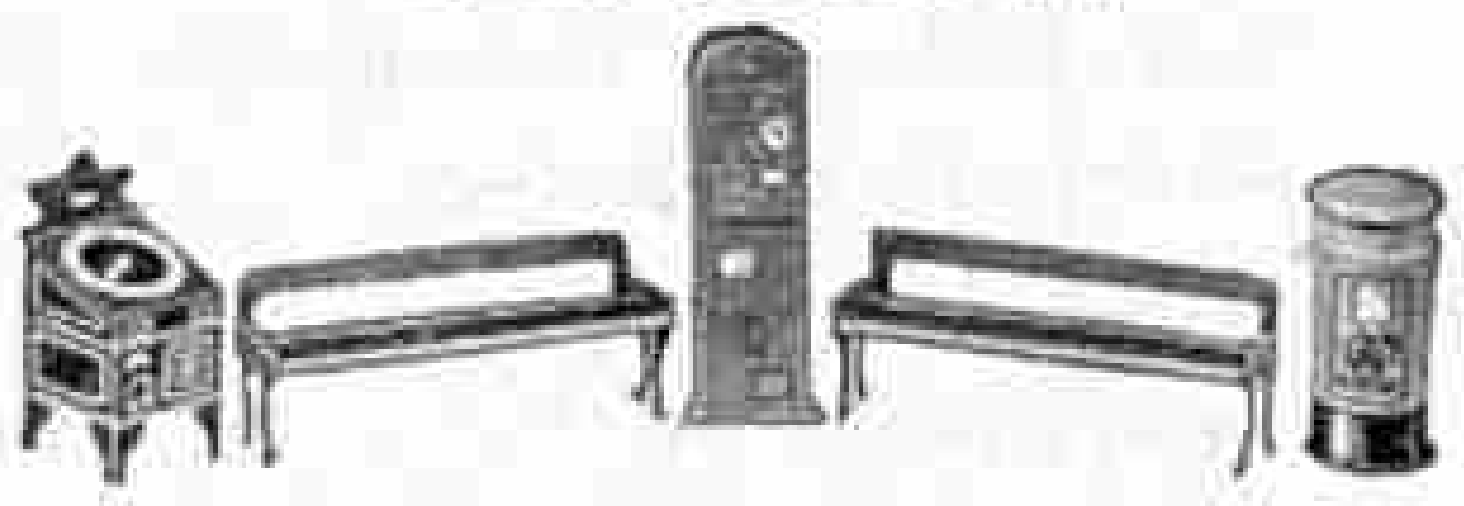

SIGNAL No. 1
Price 3/3 per pair. One "Home" and one "Distant."

TELEGRAPH POLES
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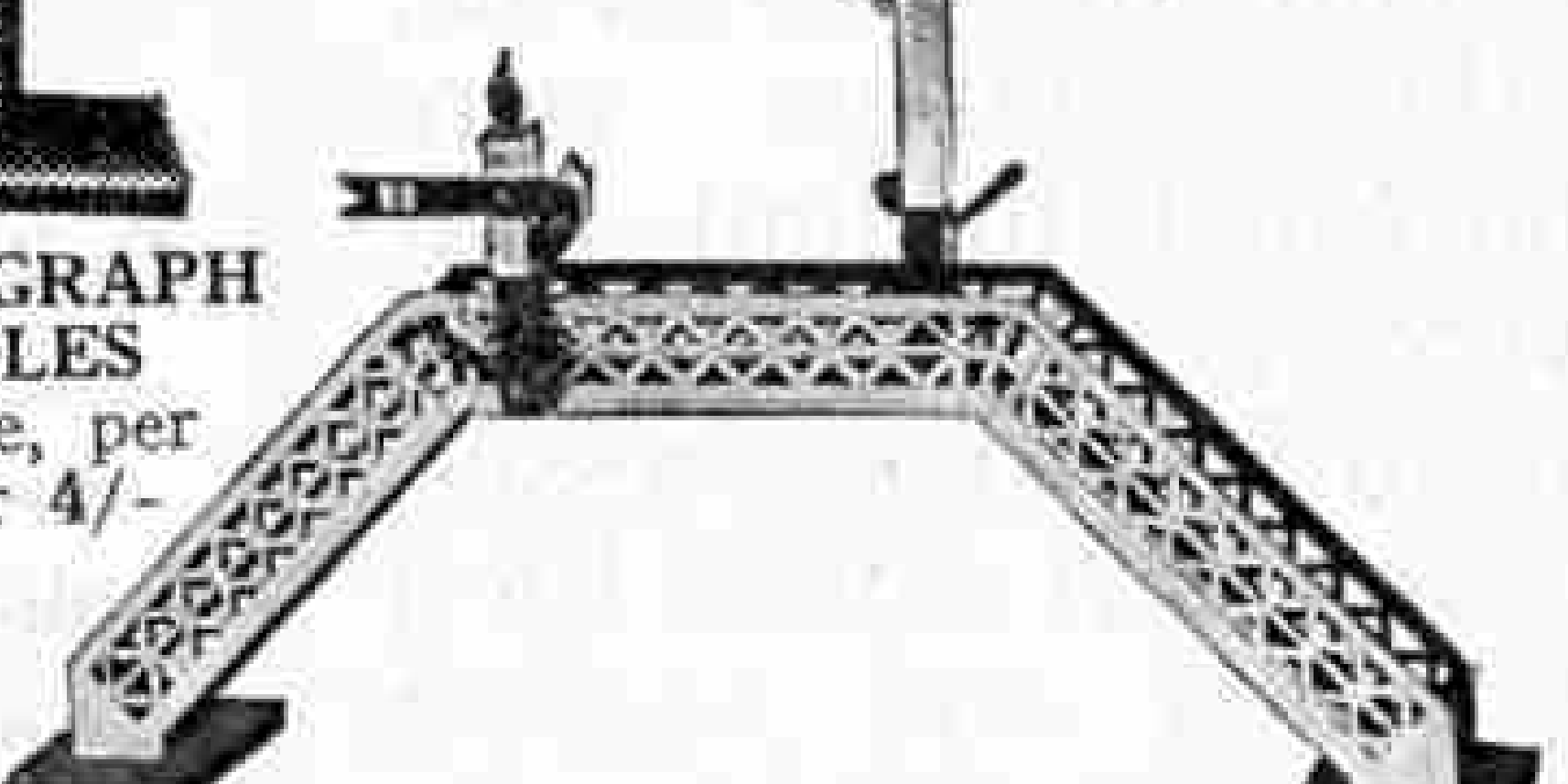

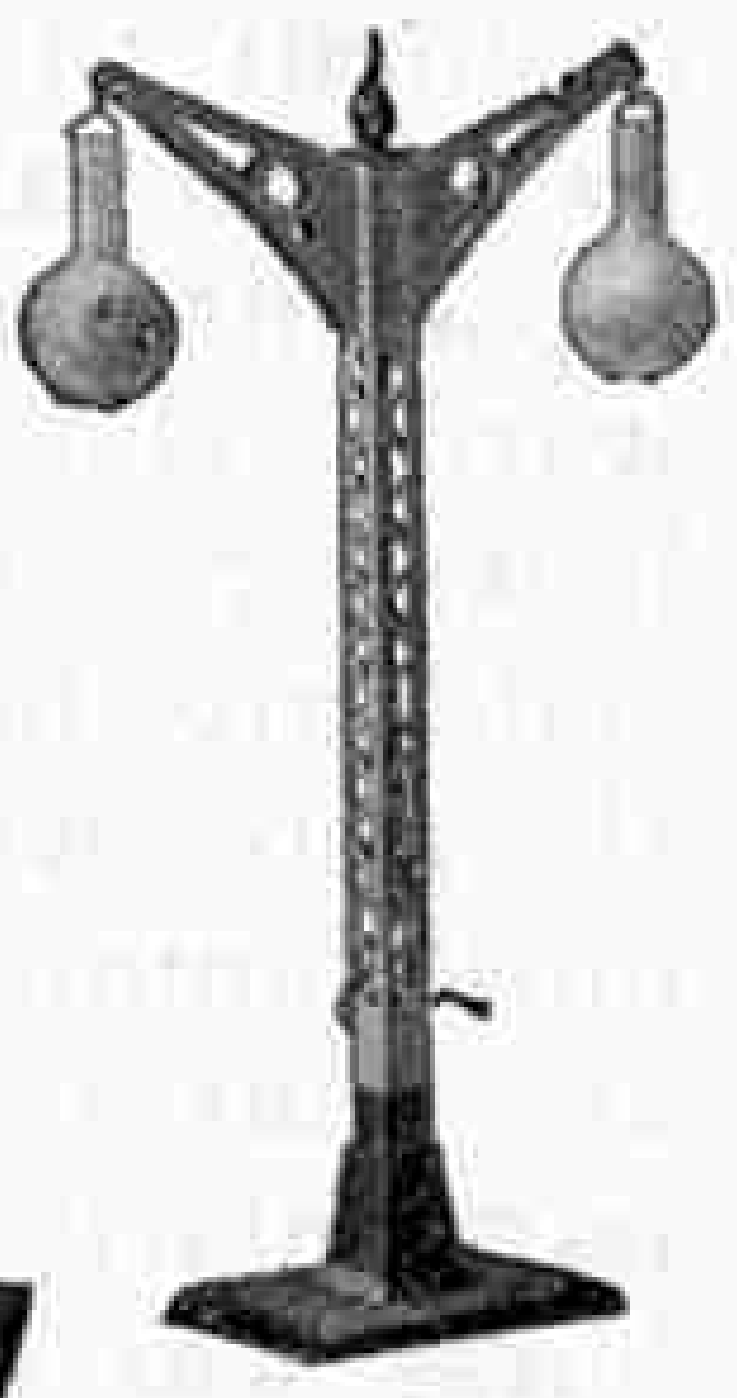

DOUBLE ARM SIGNAL No. 1
Price 4/3 per pair.
DOUBLE ARM SIGNAL No. 2
(As illustrated.)
Price 3/- each.

TURNTABLE No. 1.
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Signals only, per pair 3/9

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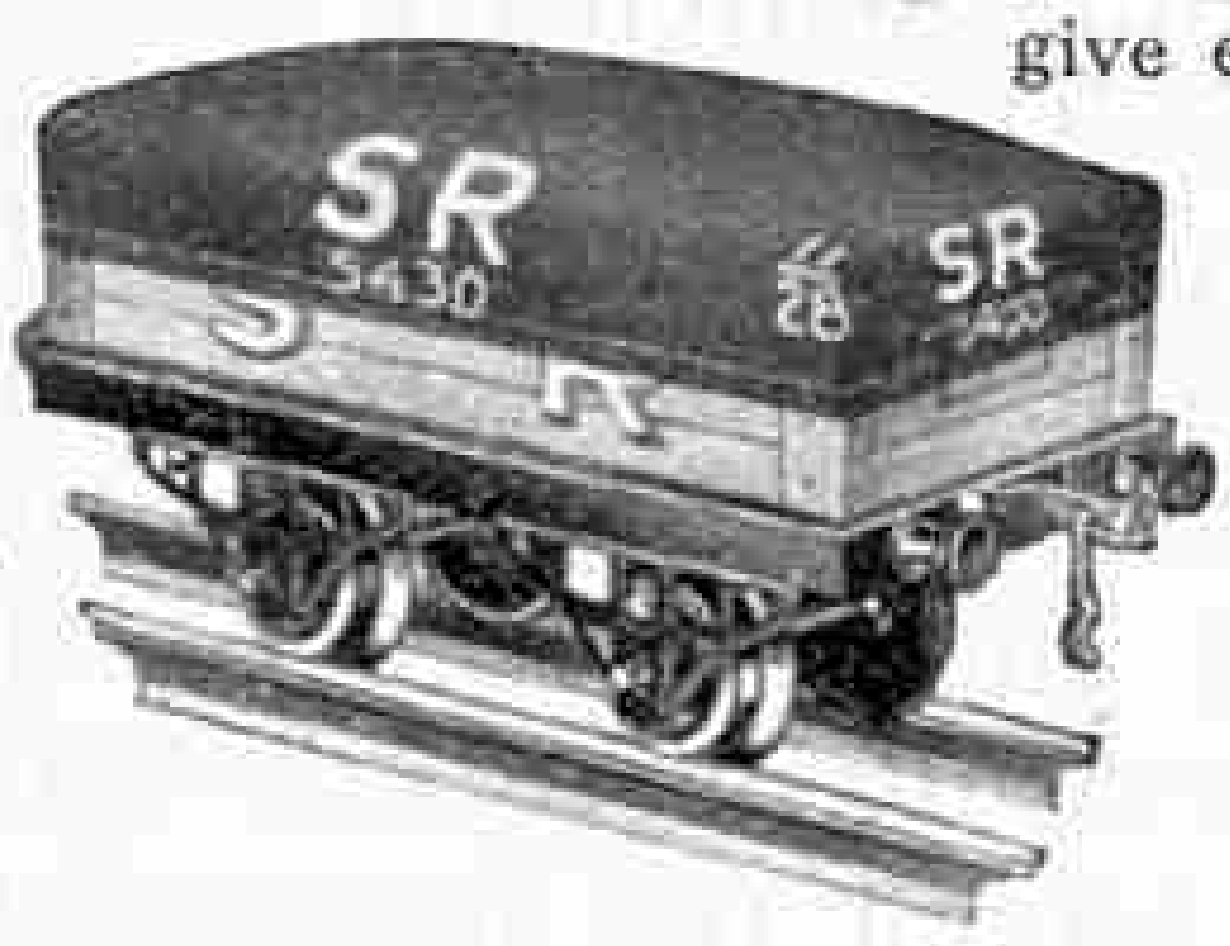

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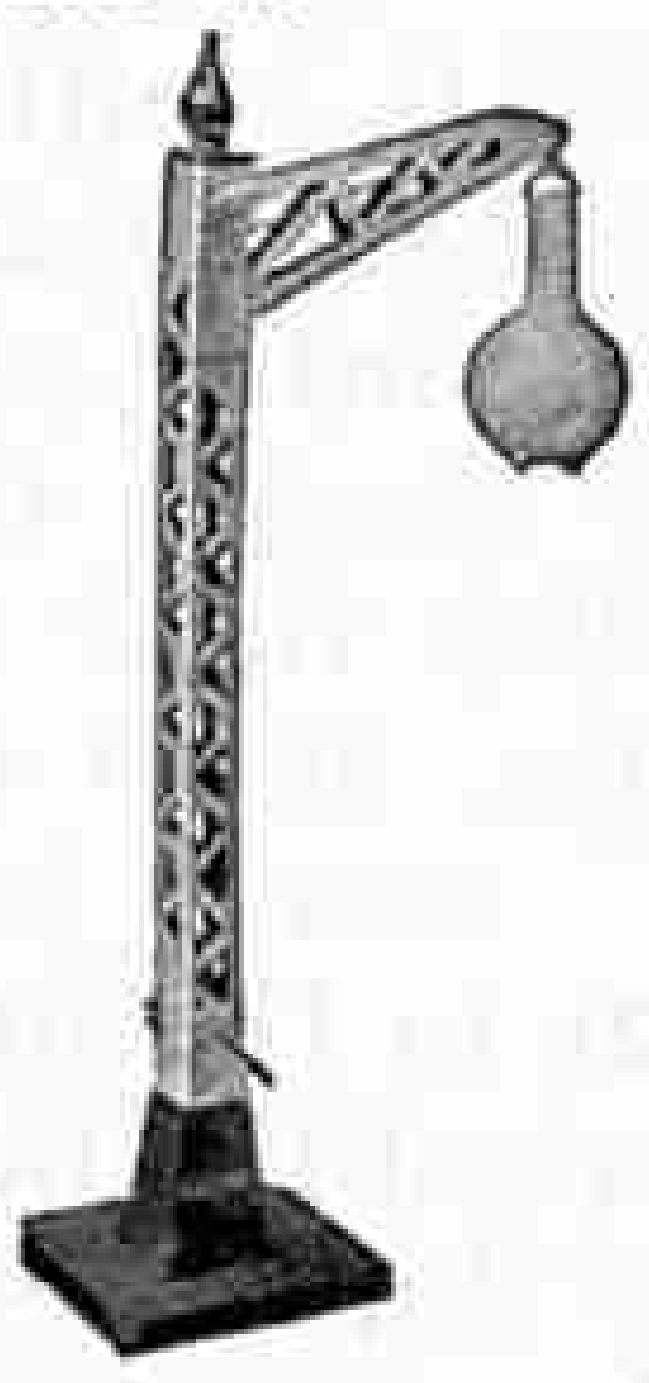

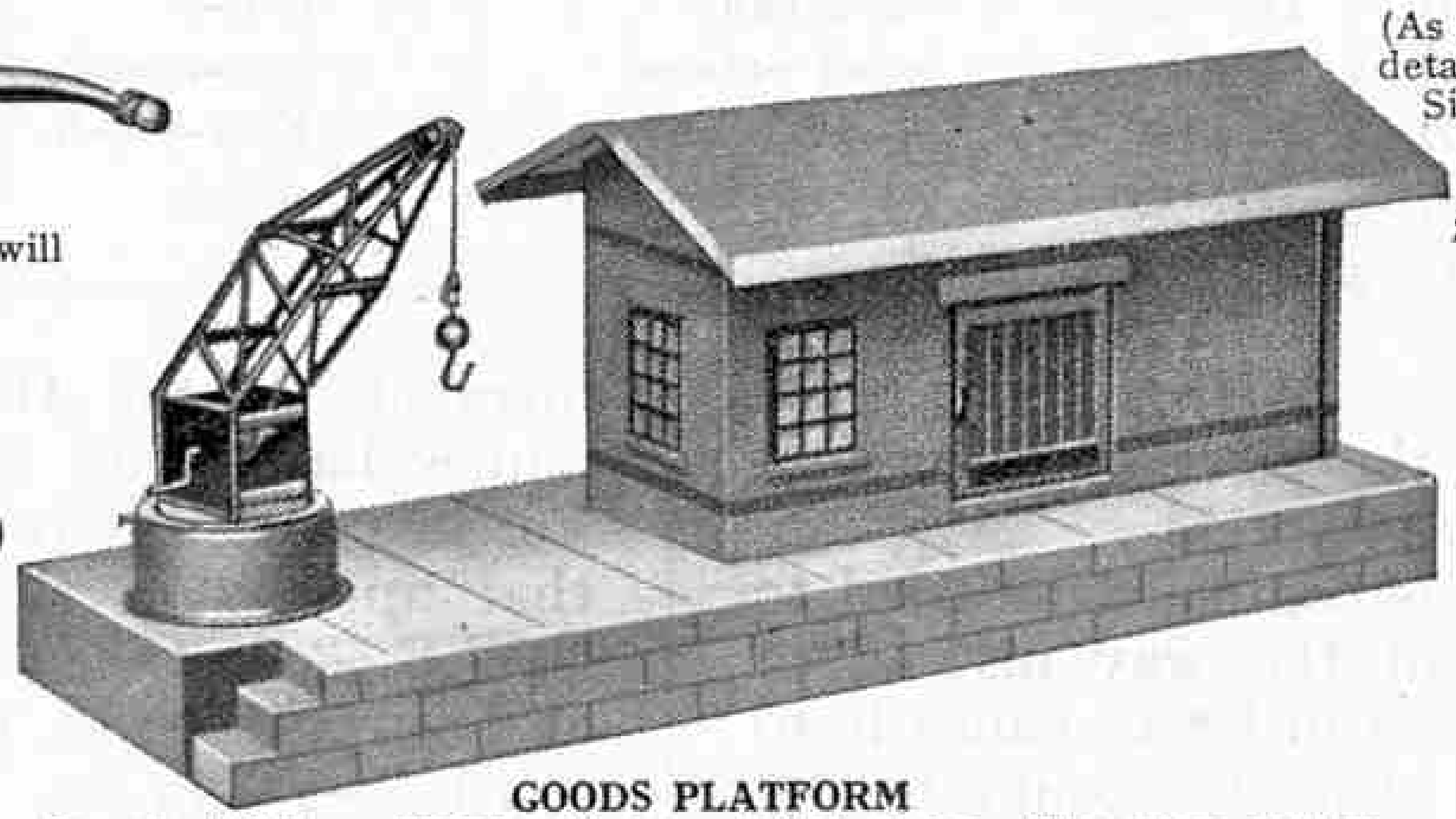

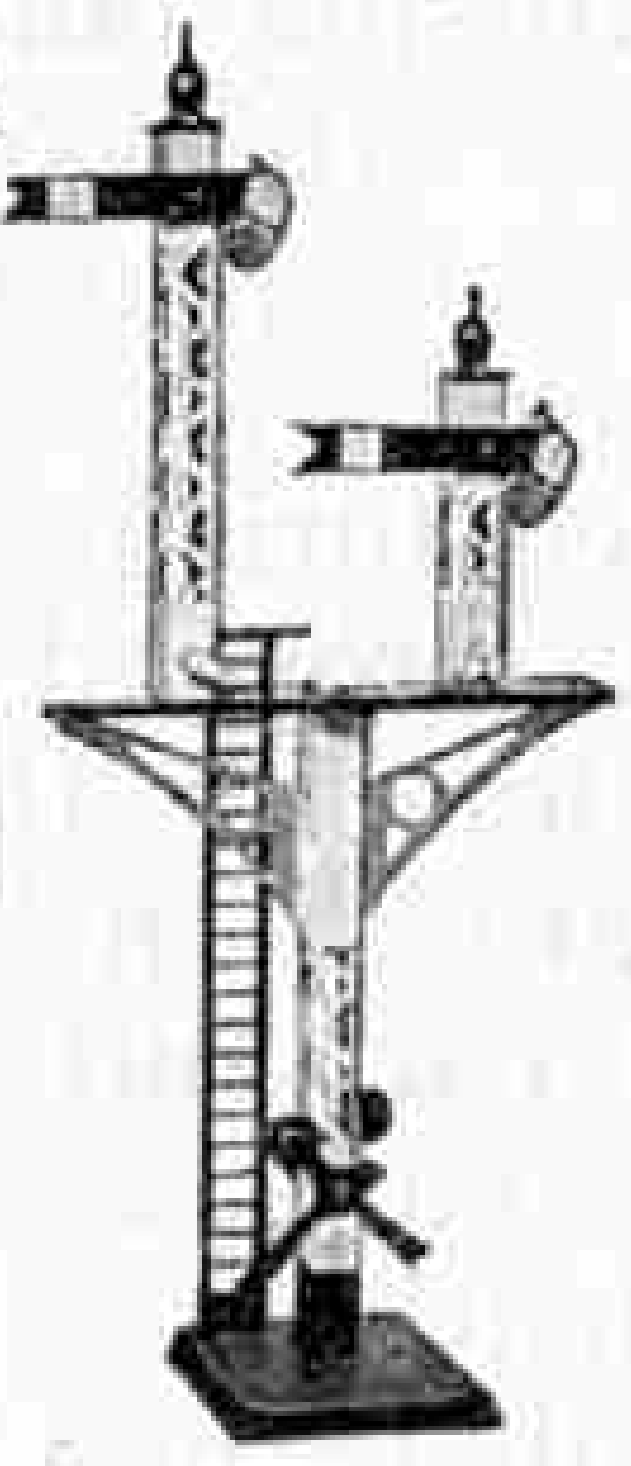

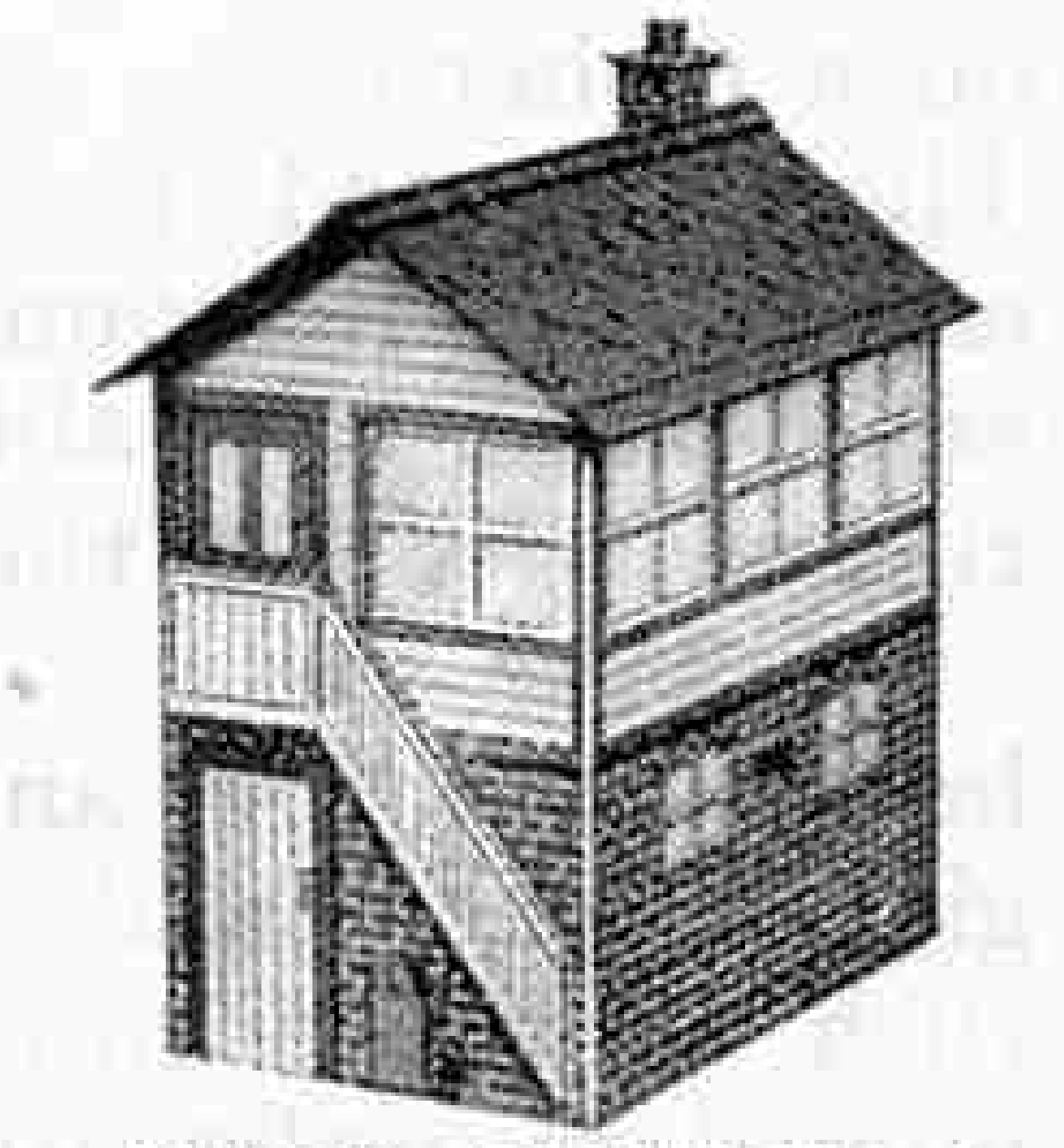

GOODS PLATFORM
Length 16¾ ins. Height 6¾ ins. Width 6 ins. The crane at the end of the platform revolves on its base. It is enamelled in colours and is fitted with a crank and ratchet mechanism for controlling the load ... ... Price 12/6

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"Home" or "Distant." Signal arms operated by levers at base. Very realistic model, standing 14 ins. in height.
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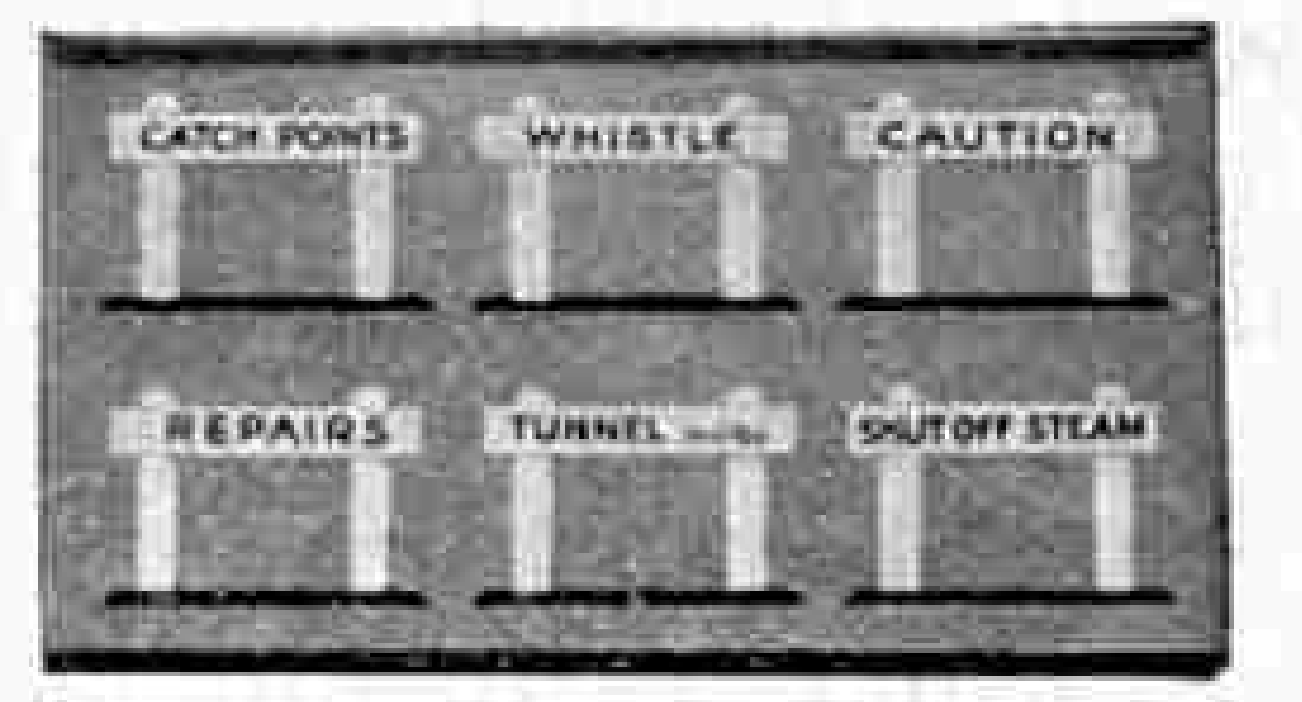

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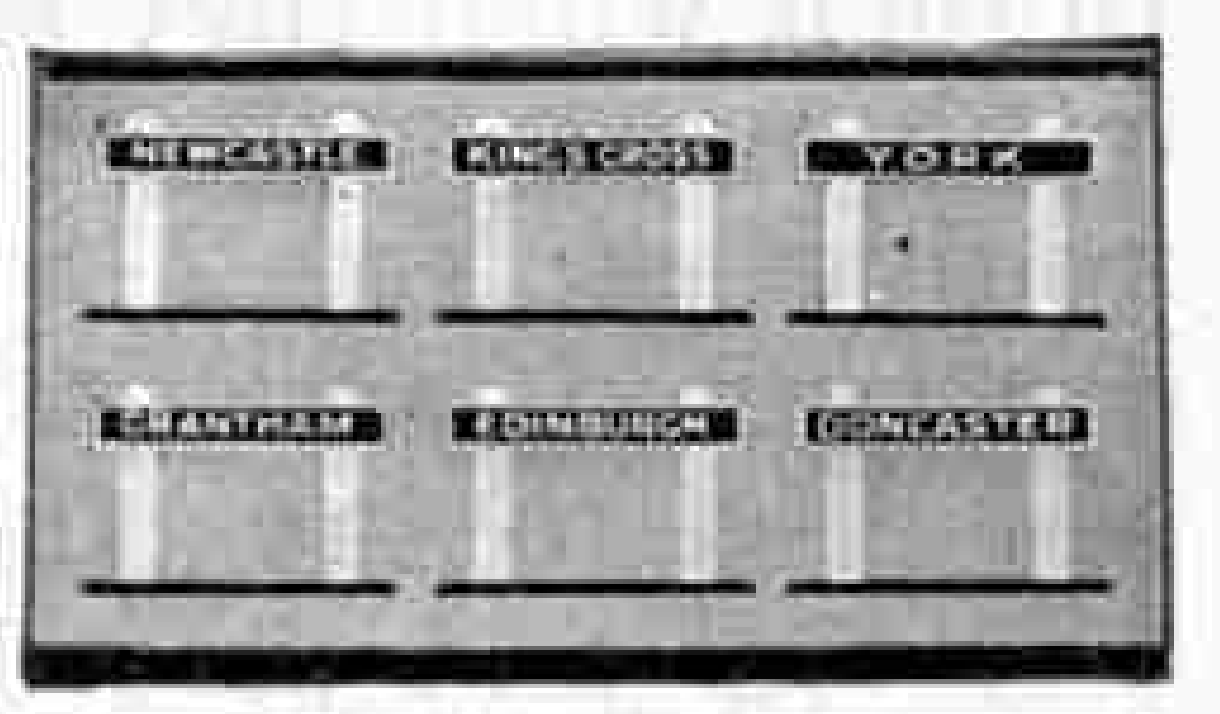
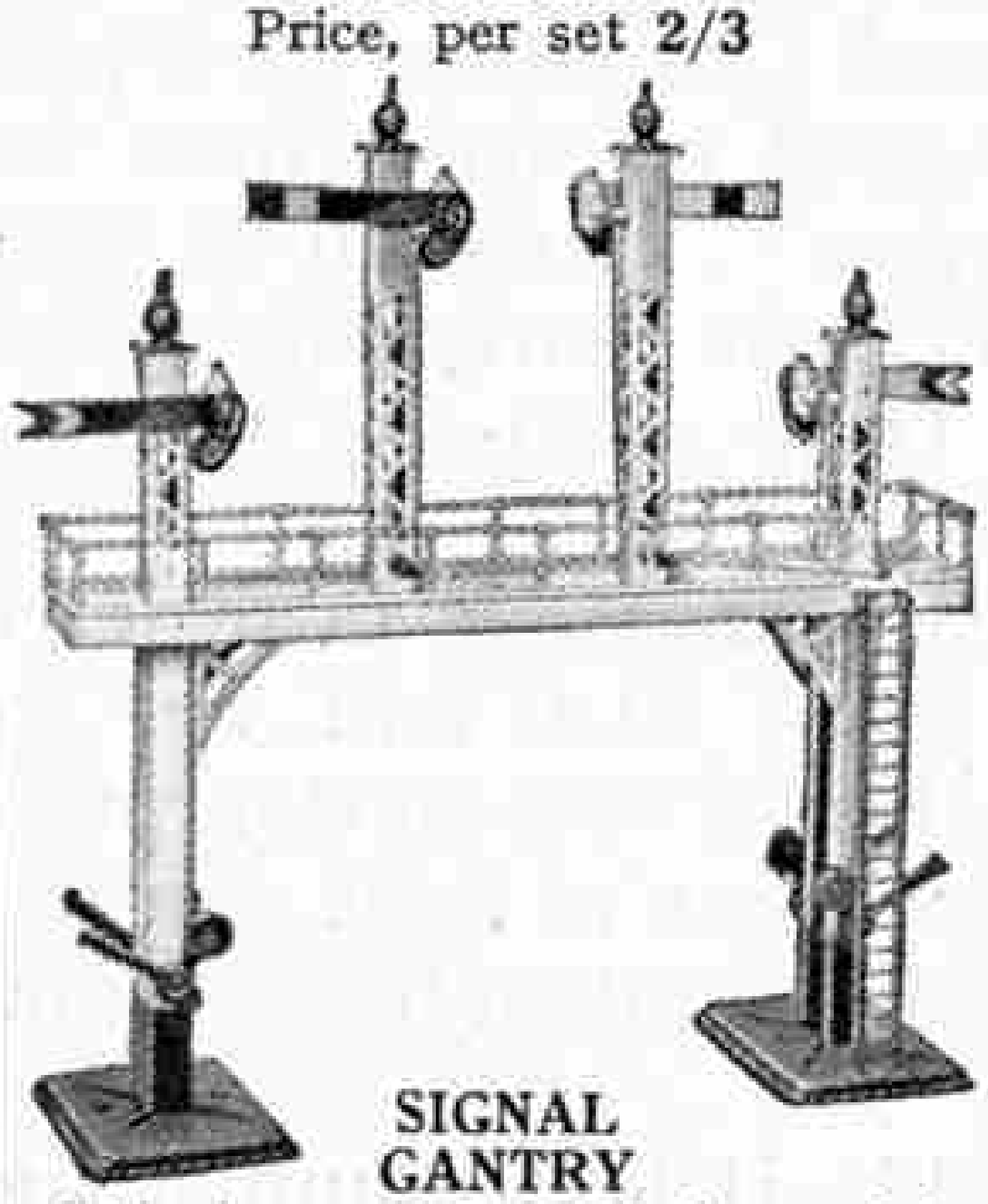
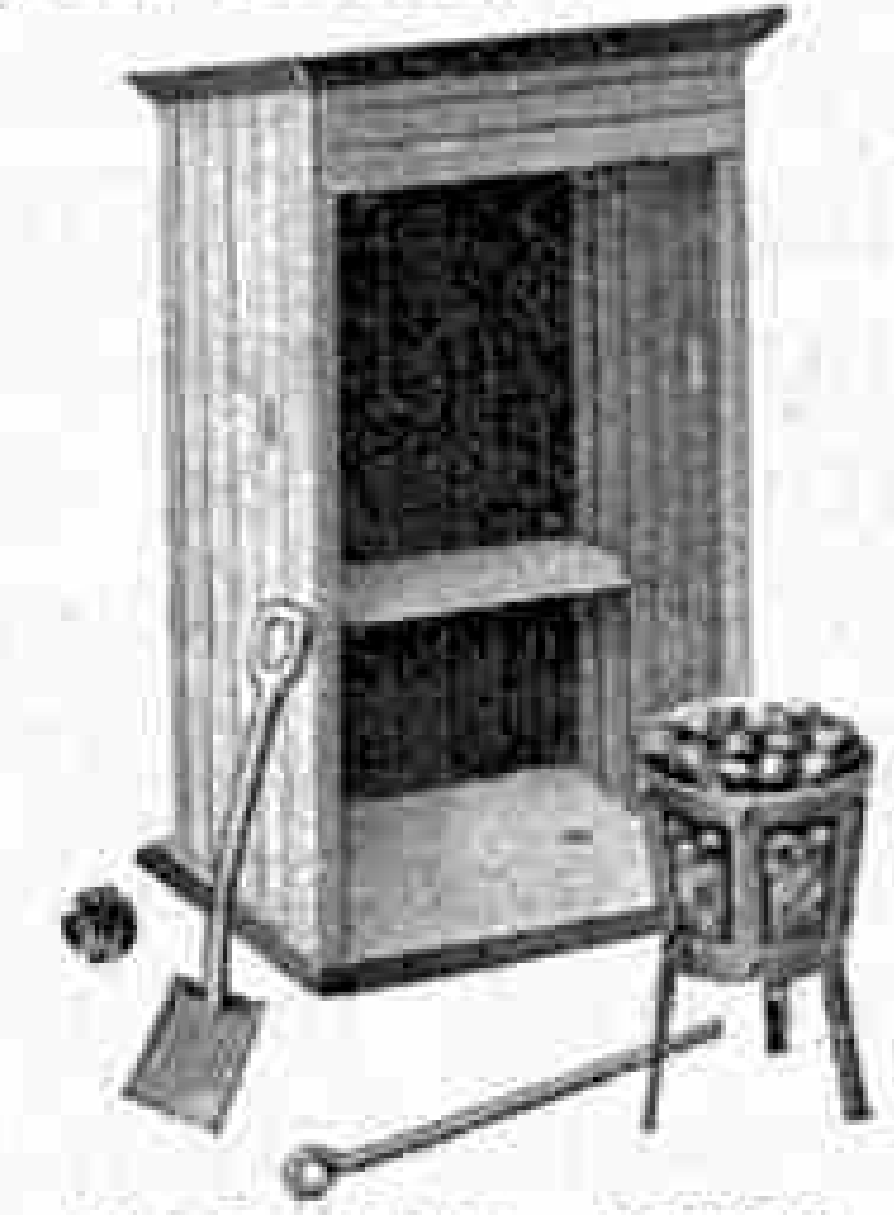
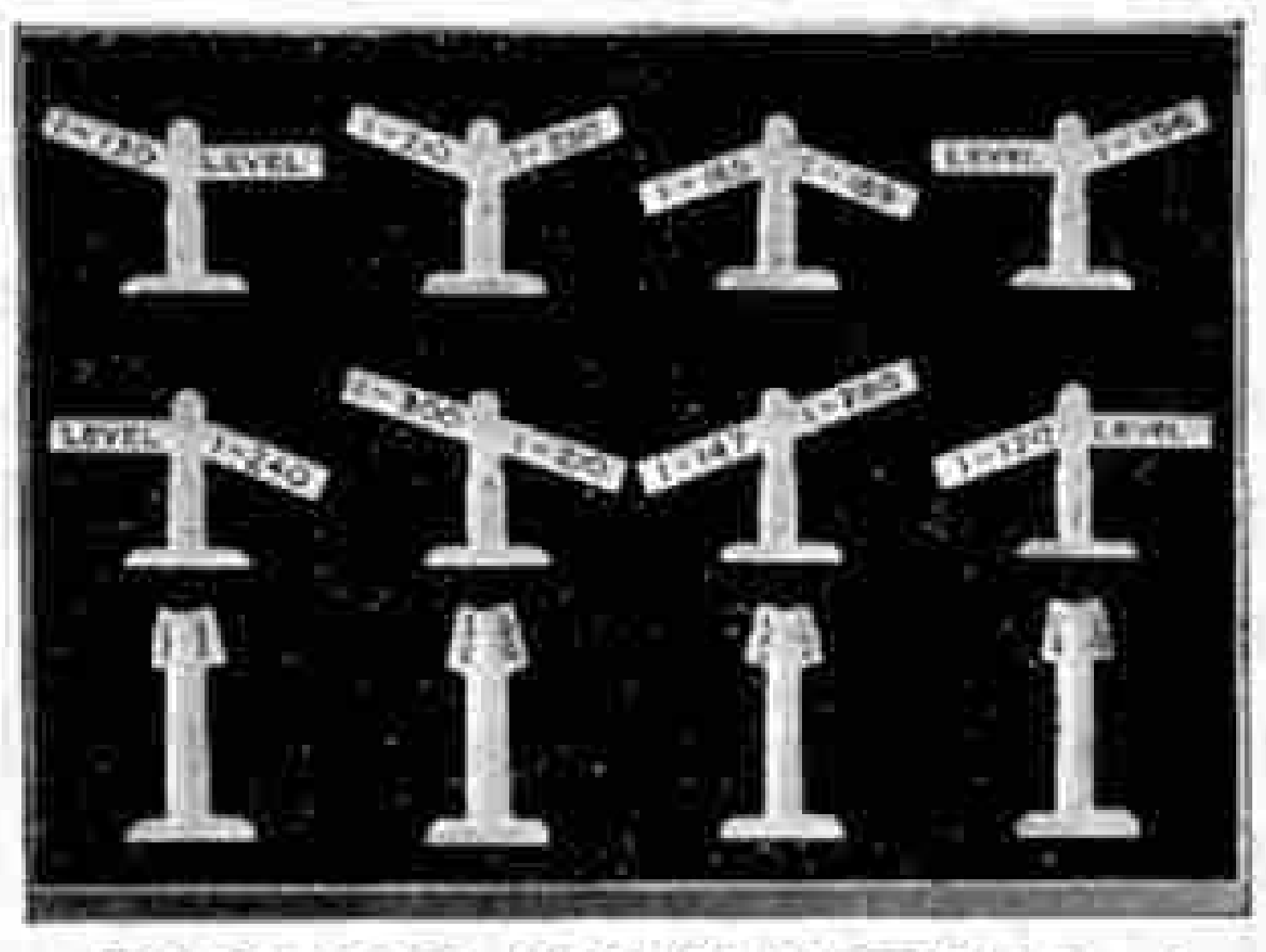
VIADUCT. Price 7/-. Centre Section only. Price 4/9
ELECTRICAL VIADUCT. Price 8/-
Centre Section for Electrical Viaduct. Price 5/3

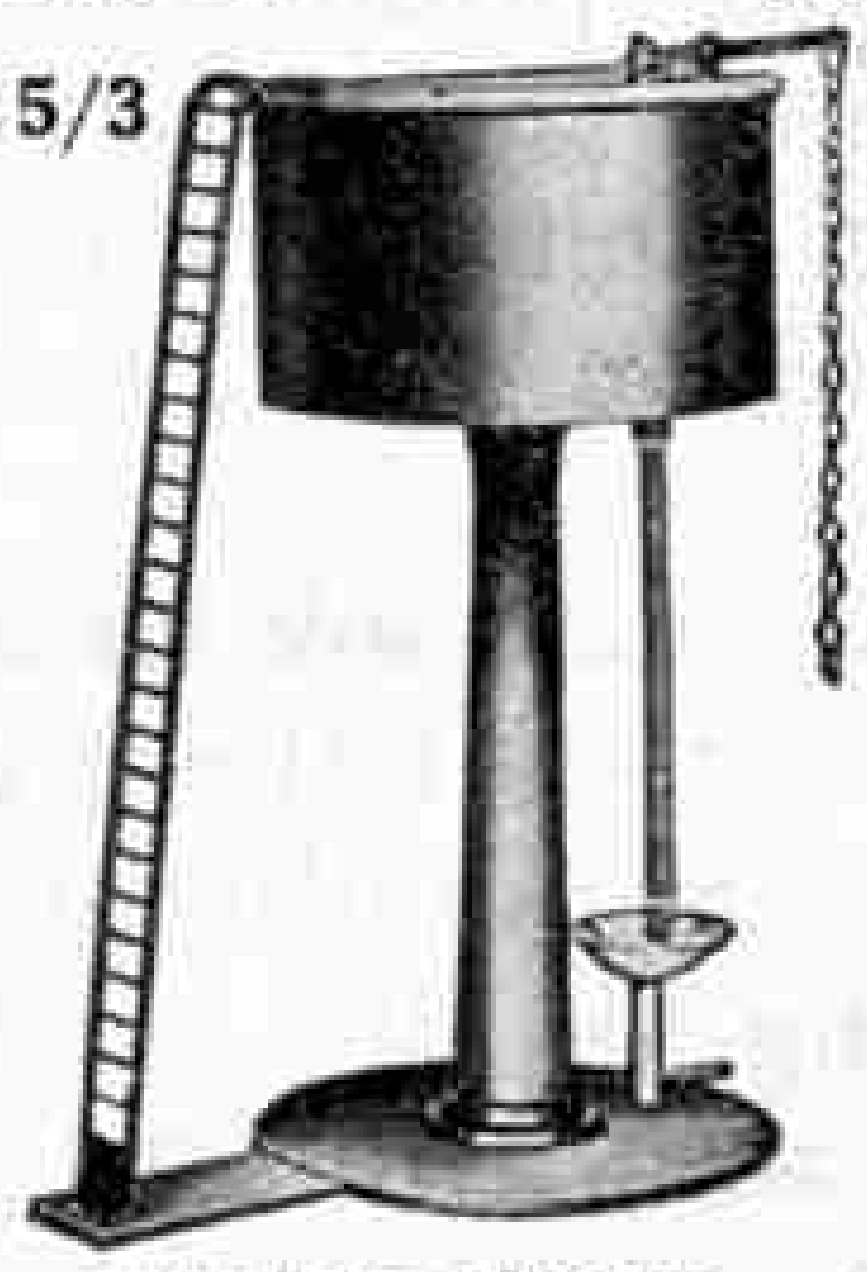


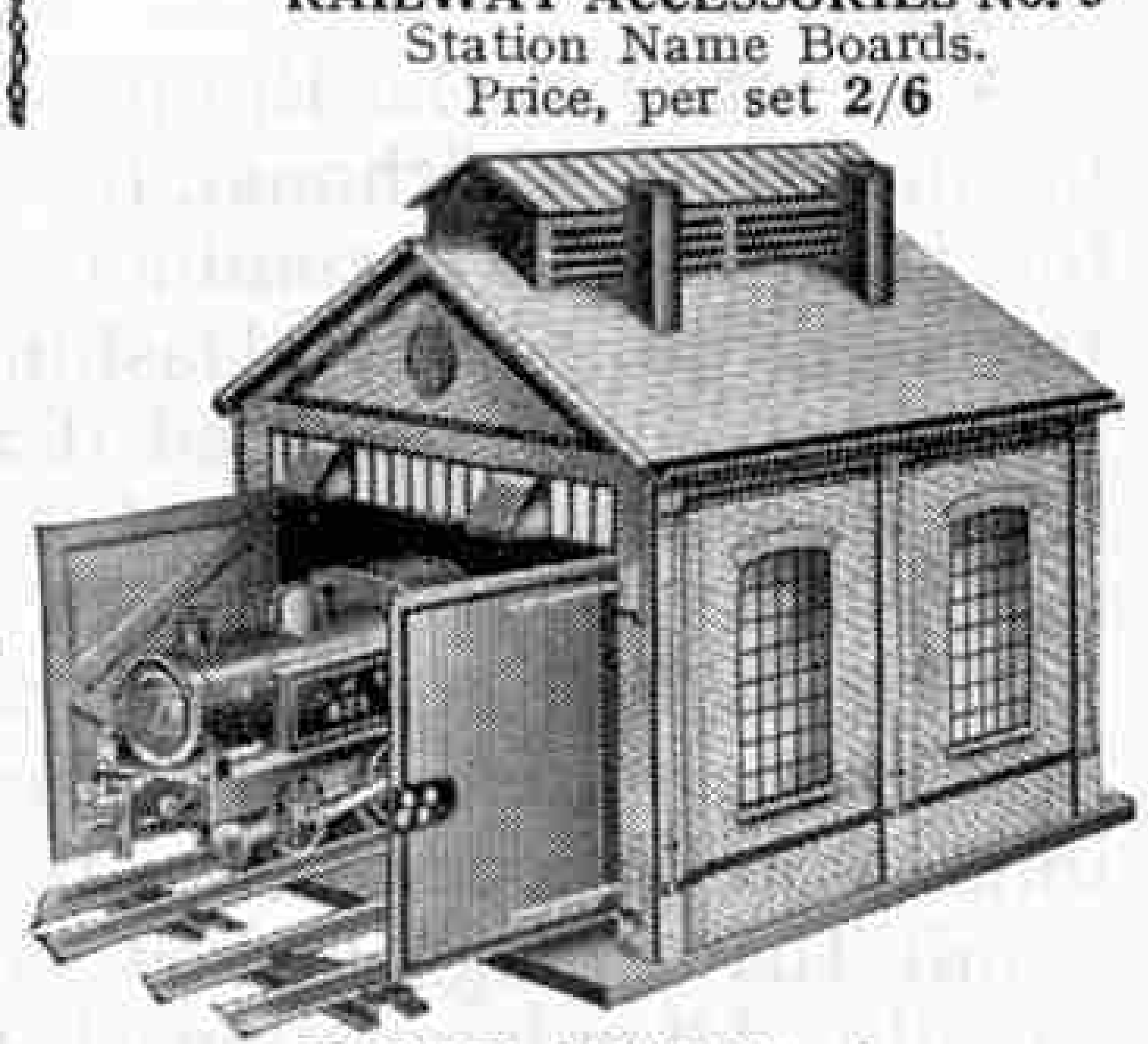
RAILWAY ACCESSORIES No. 9
Station Name Boards.
Price, per set 2/6











RAILWAY ACCESSORIES No. 7
Watchman's Hut, Brazier, Shovel and Poker ... Price 1/6

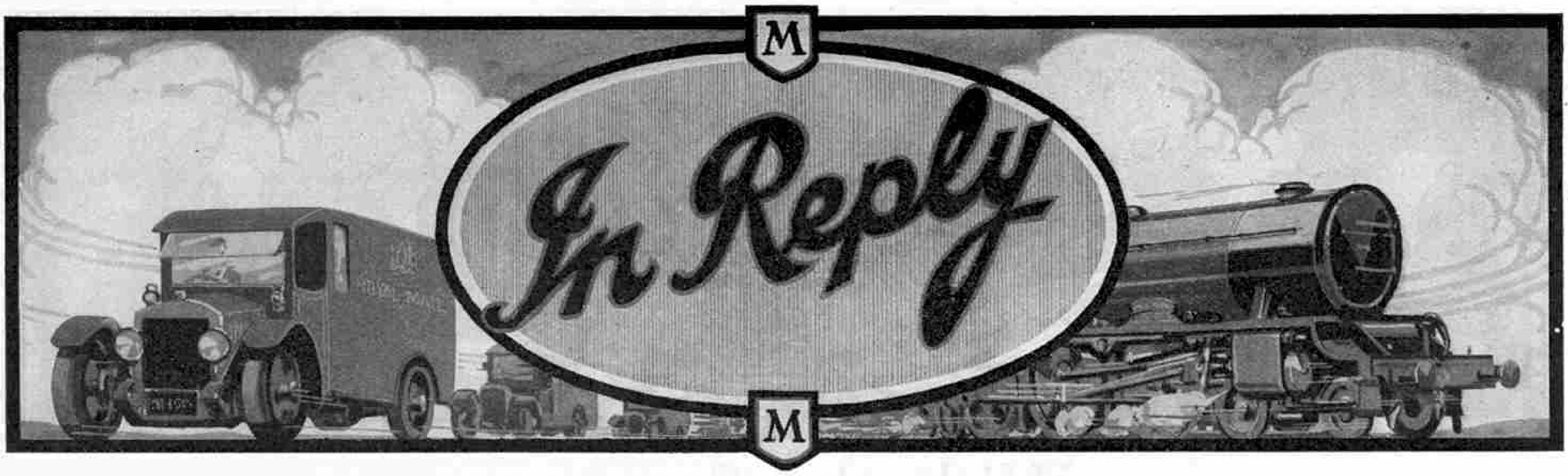
RAILWAY ACCESSORIES No. 5
Gradient Posts and Mile Posts. Price 2/-

WATER TANK
Brightly coloured. Fitted with flexible tube and valve lever.
Price 8/6

SIGNAL GANTRY
This is a very realistic model, the signal arms of which are operated by levers at the base of the standards. Attractively finished in colours. Price 10/-

RAILWAY STATION No. 2. Excellent model, beautifully designed and finished. Constructed in three sections, which are detachable. Dimensions: Length 2 ft. 9 ins., breadth 6 ins., height 7 ins. ... ... Price 12/6

ENGINE SHED No. 1
This Shed is beautifully finished in realistic colours. It will accommodate Locomotives and Tenders of the M series, No. 0 and No. 1 types ... Price 15/-



Suggested Hornby Train Improvements

TIME-TABLE BOARD.—A time-table board would make an interesting and popular addition to the station accessories now available. A platform on which one is installed would have a realistic appearance and we shall consider its introduction. (*Reply to K. W. Grimsby, Solihull*).

SALT WAGONS. The use of special wagons for salt traffic is confined to certain districts only, and for this reason we do not think that the inclusion of such vehicles in the Hornby System would be very popular. (*Reply to J. Anndale, Hornsey, N.8*).

ELECTRIC LIVE RAILS.—Electric third rails can be supplied separately at 1/- dozen. The clips and insulators necessary for securing them to the sleepers are 6d. and 3d. per doz. respectively. The rails are easily fastened by the clips into the two central slots cut for the purpose in the sleepers of Hornby rails. (*Reply to W. Armstrong, Wolverhampton*).

DOUBLE LOADING GAUGE.—Double loading gauges are rarely seen on actual railways and we do not think that such an accessory would be sufficiently popular to justify its introduction. Two of the present single type probably would serve the same purpose. (*Reply to H. Spooner, Keighley*).

DETACHABLE LAMPS.—We have now introduced small lamps that may be fitted to brackets in various positions at the front and rear ends of the No. 1 Special and No. 2 Special Tender and Tank Locomotives. The lamps are 1/- per dozen, and may be used as on real railways to indicate the class of train being hauled by the locomotive. (*Reply to E. A. Marshall, Westcliff-on-Sea*).

WIDER RANGE OF SIGNALS.—Your suggestion that two-arm and three-arm bracket signals should be introduced into the Hornby Series is quite interesting. We are filing the suggestion and if there is a demand for these signals they may be introduced in due course. (*Reply to A. O. Williams, Barmouth*).

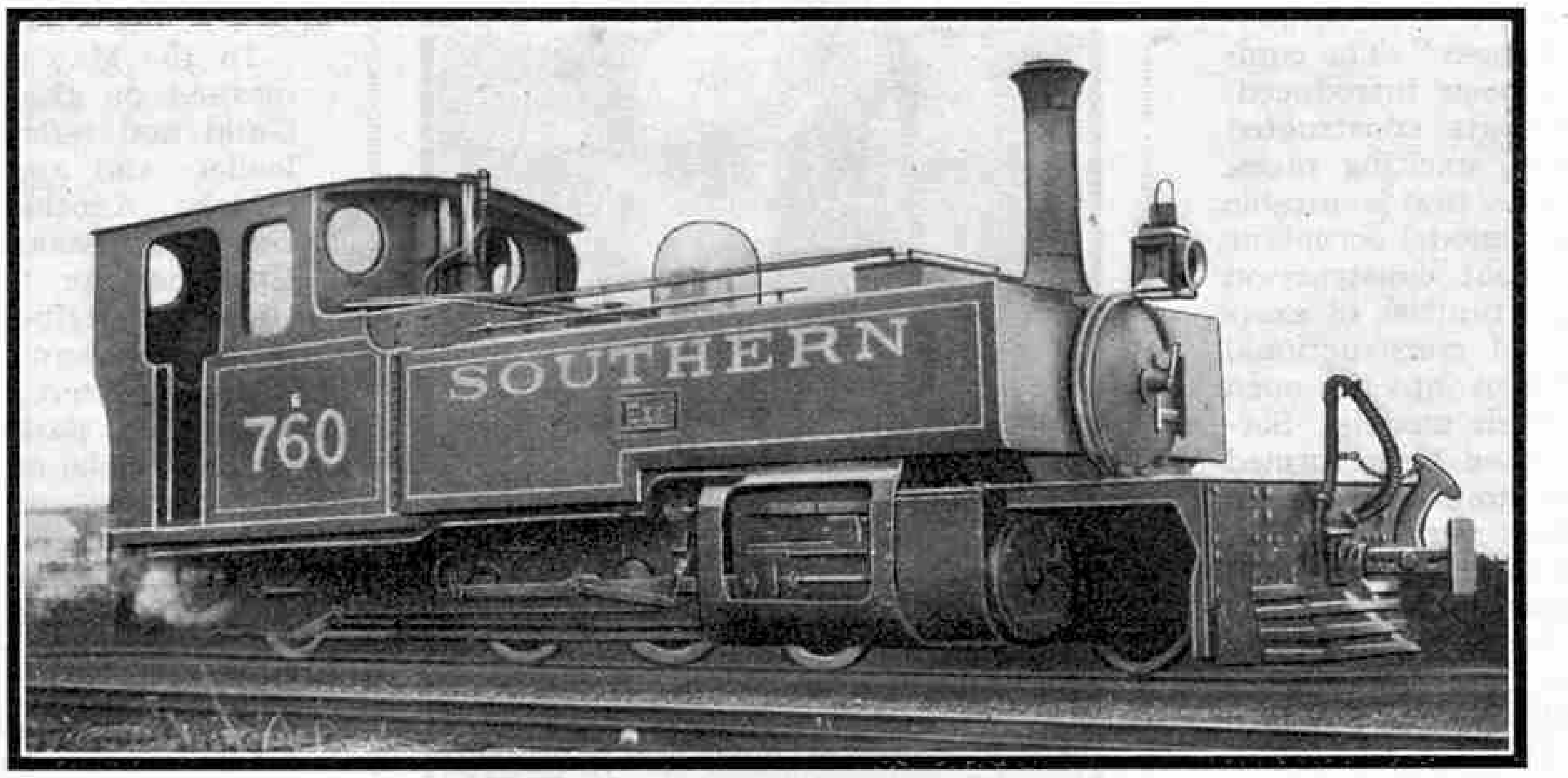
C.L.C. WAGONS.—We note that you desire us to introduce wagons lettered to represent those in use on the Cheshire Lines Committee Railway. The demand for these would be local and therefore limited, but their inclusion in the Hornby Series would add variety to the present range of goods vehicles and we shall consider your proposal when revising our rolling stock. (*Reply to A. Haworth, Dunford Bridge*).

NEW G.W.R. 0-6-0 LOCOMOTIVE.—At a later date we may consider the introduction of a model of the new G.W.R. 0-6-0 locomotive, but before doing so it will be necessary to design a six-coupled mechanism to negotiate standard curved rails. (*Reply to B. Russell, Frome*).

SCREW BRAKE ON LOCOMOTIVES.—The addition of a gradual braking device would greatly improve the realism of the working of locomotives of the Hornby Series, but the fitting would be costly and a number of problems would have to be solved before the idea could be put into practice in a satisfactory manner. Your suggestion is particularly interesting, however, and will be kept before us for future reference. (*Reply to D. Singleton, Chester*).

NAMES AND NUMBERS ON No. 2 SPECIAL LOCOMOTIVES.—No doubt model railway owners would appreciate a larger variety of names and numbers from which to select representatives of locomotives of the "Shire," "County" and other well-known classes in the Hornby Series. But if this scheme were put into operation a very large number of transfers would be required, and thus the cost of the locomotives would have to be increased. For this reason your suggestion is scarcely practicable. (*Reply to N. F. C. Morden, London, E.16*).

RAIL-BUILT BUFFER STOPS.—Although the rail-built type of buffer stop is more realistic than the present type, we do not think that the former can be introduced into the Hornby System owing to the shape of the tinplate rail. The No. 1 Buffer Stop resembles the pattern you mention, and has so far proved quite popular. (*Reply to F. Taggart, Manningtree*).



S.R. 2-6-2 Tank locomotive "Exe" of the Lynton and Barnstaple section of the Southern Railway, the gauge of which is only 1 ft. 11 in. The "Exe" was built in 1898 by Manning, Wardle & Company, and our photograph of this interesting engine was taken by our reader, S. W. Baker, Acton.

WIDER ROLLING STOCK.—We are interested in your suggestion that certain of the Hornby goods vehicles should be made wider in order to conform with scale proportions. The possibilities of doing so will be taken into consideration when alterations and additions are being planned. (*Reply to P. F. Woodman, Tenerife, Canary Islands*).

G.W.R. "SIPHON G" VANS.—We have noted your idea that the base of the No. 2-3 Pullman Car could be used in the construction of a "Siphon G" Milk Van similar to that in use on the G.W.R. The suggestion will receive attention when we are revising the rolling stock of the Hornby Series. (*Reply to E. Vernon, Exeter*).

LAMPS ON LEVEL CROSSING GATES.—We agree that the fitting of lamps on the gates of the Level Crossing would be attractive and realistic. We are unable to make the alteration at present but the idea will be borne in mind when we revise the Hornby Series of accessories. (*Reply to T. R. Stewart, Edinburgh*).

20-TON WAGON.—A 20-ton Tube Wagon with long wheelbase would add variety to the rolling stock of the Hornby Series. At present there is no real demand for such a vehicle, however, and therefore we are filing the idea for future reference. (*Reply to T. Sandham, Middlesbrough*).

SPEED CONTROL FOR CLOCKWORK LOCOMOTIVES.—The addition of a speed control device operated by a lever in the cab would add greatly to the cost of standard locomotives. For this reason we do not at present favour the introduction of such a device into the Hornby System. (*Reply to D. Ecclestone, Bungay, Suffolk*).

ENGINE SHED ROOF.—To make the roof of the Hornby Engine Shed of the "North Light" pattern often employed in real practice would give it a most realistic appearance. The idea will be carefully considered and if a definite decision is reached an announcement will appear in these pages. (*Reply to D. Pollock, St. Helens*).

IMPROVED RESISTANCE CONTROLLER.—The adoption of your design for a new resistance controller for use with 6-volt Hornby Trains would involve increased expense in production with little immediate advantage. The resistance controller now in use works quite satisfactorily, and we do not think the changes you suggest are really necessary. (*Reply to F. Platt, Dewsbury*).

LAYOUT DIAGRAMS.—We already issue a booklet giving rail formations. This is entitled "*How to plan your Hornby Railway*" and it is published at 4d. post free. It contains 28 interesting layout diagrams, together with a number of photographs of sections of various Hornby railways. (*Reply to V. Jack, Birmingham*).

LONGER FOOTBRIDGE.—A longer Lattice Girder Footbridge may easily be made by using Meccano Perforated Strips to join together parts of the existing Footbridge. One objection to including a longer bridge in the Hornby Series is the inconvenience of packing. (*Reply to B. Stephens, Crewe*).

THREE-WAY POINTS.—The introduction of three-way points would not give sufficient advantages to justify the expense, and so far there has been little demand for them. With a modified type of parallel point, having one straight and one curved branch, three adjacent lines could be as easily constructed as with a three-way point and we shall consider your idea. (*Reply to G. Brown, Huddersfield*).

SLOPING TANKS FOR G.W.R. LOCOMOTIVES.—We are aware that on many G.W.R. tank locomotives the tops of the side tanks slope downwards toward the front end. To incorporate this feature in the Hornby G.W.R. tank locomotives would necessitate an increase of price, and at present we cannot consider your suggestion. (*Reply to W. Cook, London*).

STATIONS WITH LONGER PLATFORMS.—Extensions to the present Hornby stations may easily be made by using one or more of our standard passenger platforms. These may be readily attached at each end of the centre section of the station and the sloping ramps may be fitted on the ends of the long platforms thus made. (*Reply to J. V. Warr, Belgrano, Argentina*).

L.N.E.R. "SANDRINGHAM" LOCOMOTIVE.—We quite agree that this class of locomotive would form an attractive addition to the Hornby Series. When a six-coupled mechanism is available we shall consider the claims of the "Sandringham" type. (*Reply to T. Smythe, Harwich*).

With the Secretary

Original Plans for Summer Programme

In practically all clubs a full programme of visits, outdoor games, and recreations is being followed this year, and I have been very pleased to note that in many cases original schemes are being put into operation. These interest members very greatly and usually have the great advantage that they do not interfere with cricket and other games already arranged.

An instance of a new activity of this kind is the model boat section that has been formed in one club. This not only introduces a new hobby, but provides a very good reason for outdoor work. Reports from this club show that members thoroughly enjoy designing and constructing model boats of all types and sizes, and derive even greater pleasure from demonstrating their "sea-worthiness." The competitive spirit also has been introduced, for the model sailing boats constructed have taken part in many exciting races.

Another interesting hobby that is suitable for the summer months is model aeroplane building. Like model boat construction this gives members opportunities of exercising their designing and constructional skill—and also entices them into the open air in order to try out their models. Sections for this purpose have been formed in several clubs, and in more than one of these the hobby is taken very seriously, meetings for discussion of the design and handling of models being held regularly.

The two examples I have given do not exhaust the possibilities. No doubt other interesting and original schemes for providing members with healthy recreation during the summer months have been thought out by Leaders and officials of clubs. I hope that those who have done so with success will write to me to explain their ideas, for these may be of service to other clubs.

Meccano Club Leaders

No. 45. Mr. J. Watson

Mr. J. Watson is the Leader of Marlowe (Wallasey) M.C. This club was affiliated as recently as March of this year. The excellent programme followed includes Model-building Contests and Lantern Lectures, and members recently enjoyed a visit to the Meccano factory at Liverpool.

Filling up a Wet Spell

Although indoor games and hobbies lose part of their attractiveness on warm and sunny days, they may prove decidedly useful in the event of wet weather. Nothing is more disheartening to a group of boys intent on an interesting excursion or an exciting outdoor game than to have the event ruined by rain. Leaders should be prepared for an emergency of this kind, and should endeavour to mitigate the disappointment by arranging at short notice a games tournament or similar event indoors.

This plan involves very little preparation. All that is necessary is to ensure that the club room may be open and instant access obtained to the games outfit, which of course should be maintained in good condition even when not in use. Members will find consolation for an abandoned game of cricket in a fiercely contested series of matches at table tennis or in a rifle shooting contest.

Even if activities of this kind are impossible it is not necessary that a meeting should be abandoned because of wet weather, and other plans for preventing the disconsolate break-up of an outdoor gathering will occur to most Leaders. Some members may wish to take the opportunity of carrying out odd jobs in the club room, or of making some accessory for club use; others will enjoy a debate on some exciting topic of the moment. Calling upon the members for impromptu speeches is another plan that will be found helpful in this respect. The subjects may be written on slips of paper, which are then drawn from a hat. If the topics dealt with are humorous in character a very successful time usually follows the adoption of this suggestion, for members enter willingly into the fun of proceedings of this kind.

Further Guild Progress

In the May issue of the "*M.M.*" I remarked on the steady expansion of the Guild and referred to the issue of Guild leaflets and application forms printed in Dutch. Another country in which the Guild is making headway is Greece. Enquiries for information regarding the Guild are beginning to reach Headquarters in greater numbers than previously and increased interest in its activities are being displayed, particularly in Athens, the capital of the country.

The most encouraging sign of real progress in Greece is the formation of a very strong Meccano club in connection with the Athens College. This has become so firmly established that affiliation to the Guild now has been secured. The members are very enthusiastic and a bright future seems assured.

The club has already taken rank as one of the societies regularly associated with the College and a record of its activities appears in "*The Athenian,*" a fortnightly magazine published by the Student Government Association of the College. This is an excellent production, printed partly in English and partly in Greek. The contents are written and edited by the students themselves, and not only give news of the school but deal with many topics of wide interest.

Proposed Clubs

Attempts are being made to form Meccano Clubs in the following places, and boys interested should communicate with the promoters whose names and addresses are given below:—

BRENCHLEY—R. E. K. Levett, The Ridgeway, Brenchley.
CANADA—Murray D. Bryce, 908, Heywood Avenue, Victoria, B.C.
CANADA—A. Saunders, 207, Times Building, Moose Jaw, Sask.
CARLISLE—C. E. Hammond, 66, St. James Road, Carlisle.
CO. CORK—T. Bourke, Assolas, Kanturk, Co. Cork.
CO. DOWN—B. Slinger, Eglinton Terrace, Newcastle, Co. Down.
NEW ZEALAND—J. E. Barnsley, Newport Terrace, Wellington.
PURLEY—G. C. J. Green, "Tygasome," Riddlesdown Road.
ROMFORD—F. A. Goodey, 55, Shaftesbury Road.

CLUB NOTES

Blackburn No. 1 M.C.—Models exhibited at the very successful Annual Exhibition included the Ship Coaler, Drop Hammer, Eiffel Tower, and a Meccano Loom constructed by one of the members, who wove cloth with it during the Exhibition. Cake, Fruit and Sweet Stalls were arranged. A Treasure Hunt proved a great attraction. In this visitors were invited to stake claims on soil piled up on a table to represent " Treasure Island." The loot had been buried in a place unknown except to the organisers, and at the close of the Competition was awarded to the competitor whose peg had been placed nearest. Club roll: 45. *Secretary*: F. Hadfield, 72, Cleaver St., Blackburn.

Victoria (Glasgow) M.C.—Lectures have been given on " *The History of the Clyde* " by Mr. R. White, and the " *Steam Indicator* " by the Leader, Mr. H. C. Thompson. An interesting meeting was held in conjunction with visitors from the Edinburgh M.C., at which Mr. R. Croall, Leader of the last-named club, gave a Lantern Lecture on "*The Railway Centenary*," slides being kindly loaned by the L.N.E. Rly. A return visit was paid to Edinburgh. Club roll: 50. *Secretary*: R. Hannah, 52, Thornwood Avenue, Glasgow.

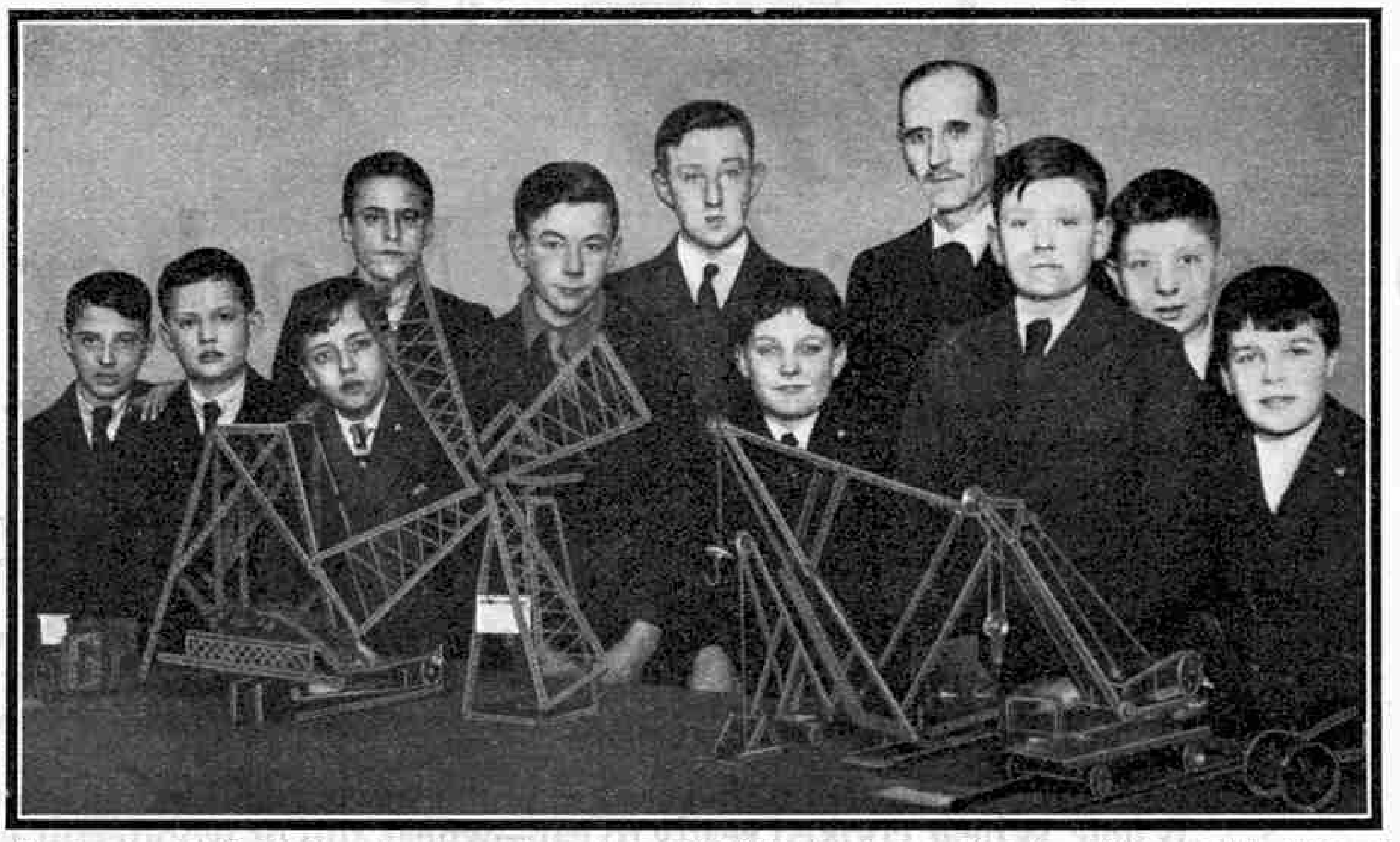
Weymouth Central School M.C.—A visit has been paid to Portland Dockyard, where a Ship Coaler, the Floating Dock, and many Cranes were inspected. On a Cycle Run Gravel Pits were visited and there a Ruston-Hornsby Excavator and a Sifting Plant were seen at work. At a well-attended open meeting Lectures on " *Liners Through the Ages* " and "*Liners During the Great War* " were given. Club roll: 15. *Secretary*: A. H. Brake, 2, Charles St., Weymouth.

Solihull School M.C.—In a recent Model-building Competition Mr. C. N. J. Hornsey, Leader of Gaywood M.C., very kindly judged the models, the First Prize being awarded to the Secretary for a model of a Weighing Machine. Interesting Debates, Social Evenings and Model-building Evenings have been held, and at a Visitors' Night a fine show of working models was on view. After a Lecture on "*Racing Cars*" by Mr. G. R. Sanders, an interesting discussion took place. Club roll: 18. *Secretary*: L. V. G. Watson, Solihull School.

Newcomen (Hull) M.C.—A club Magazine to be published quarterly has been established. Papers have been read by several members, one of special interest being on the " *Internal Combustion Engine.*" An excellent summer programme is being followed, this including Cricket, Cycle Runs, Sports, Rambles and Swimming. An Excursion also is being arranged. At ordinary meetings pairs of members take it in turn to provide entertainments. Club roll: 12. *Secretary*: H. Acklam, 103, Newcomen St., Hull.

John O'Gaunt (Lancaster) M.C.—The club's Exhibition was very successful. The winning entry in the Model-building Competition held in connection with it was a Gramophone that with the exception of the horn was constructed entirely of Meccano parts. A " Simplicity " Model-building Competition was keenly contested. Most of the entries were model Racing Cars, and these were tested for running powers as well as for appearance. Hobbies Evenings, Aeroplane Nights, and a Mock Trial also have been held, and Visits paid to the local Power Station and Gas Works. Club roll: 21. *Secretary*: J. B. Crossland, 4, Chester Place, Lancaster.

Middlesbrough M.C.—An interesting address on " *The Romance of the Quebec Bridge* " was given by Mr. J. Senior. At other meetings a Mock Court was held and the question " *Should Boys under 16 be allowed to ride Motor Cycles* " was debated. The Annual Parents' Evening was the most successful yet held, the hall being crowded. Musical selections were given by the club orchestra, and after an address on " *Time and Chance* " by Mr. A. R. Desmond, prizes and certificates were distributed, and a case of pipes presented to Mr. W. Hewitt, the Ambulance Class Instructor. Club roll: 82. *Secretary*: Mr. A. Bradley, 95, Deepdale Avenue, Marton Grove, Middlesbrough.



The Leader, Mr. S. Willis, and a group of members of St. Columbas M.C., with a few of the models displayed at the club's successful Exhibition and Concert. More than 400 visitors were present, and an excellent report appeared in the " Sunderland Daily Echo," from which our illustration is reproduced by permission.

Fulstow Junior M.C.—The completion of the first year as an affiliated club was celebrated by a Social. A Lantern Lecture entitled " *Beautiful Manxland* " and an exhibition of slides illustrating " *British Ships* " were followed by Refreshments and Games. A fine series of Model-building and other Competitions has been carried out, the subjects of most of these being of an engineering character. Club roll: 16. *Secretary*: L. W. Doe, The Stores, Fulstow, North Thoresby, S.O., Lincolnshire.

Chertsey M.C.—Three Lectures by members on their favourite hobbies have been given. Other meetings included Model-building Contests and discussions on hobbies. Talks on " *Stamp Collecting* " and " *Electric Railways* " have been given, and a visit paid to the Printing Works of the " *Surrey Herald.*" Hornby Train Evenings are held regularly. Club roll: 34. *Secretary*: E. V. Brown, Arbon Grove Cottage, Lyne, Chertsey.

Headington M.C.—Members have been occupied in Model-building and also in outdoor games. A Lantern Lecture on " *The Times of Oliver Cromwell* " was given by Mr. H. J. C. Alden, President of the club. Visitors were invited and proceeds amounted to 13/–. Club roll: 50. *Secretary*: H. Jacob, High St., Old Headington, Oxford.

Bideford M.C.—An interesting meeting called " Invention Show " was held, when models illustrating novel ideas were built. Other evenings have been devoted to Competitions and Games. Railway Nights are held regularly and on one of these interesting races between trains were arranged. Club roll: 13. *Secretary*: H. L. Farr, Lavington House, Bideford.

Lindisfarne College M.C.—The club has been divided into two sections, meeting on different nights for Model-building and other Competitions. All paid a visit to the South Kensington Museum in order to attend Lectures, special terms being offered to parties. A Lecture was given on " *Aeroplanes* " by Mr. Barry Adams, an old boy of the school, who illustrated his talk by demonstrations on a model aeroplane of his own construction. Special Model-building Nights have been devoted to the construction of Bridges, Cranes, Motor Lorries and Motor Cars. These were exhibited on Visitors' Nights, along with other interesting models and a large Hornby Layout. Club roll: 42. *Secretary*: H. Sebel, 27, Seaforth Road, Westcliff-on-Sea.

Stockton-on-Tees M.C.—Games Nights are being held regularly and members make good use of a Gymnasium that has been placed at their disposal. Many excellent club models constructed have included one of the Vertical Lift Bridge that it is proposed to erect at Middlesbrough, as noted in " *Engineering News* " of the June Magazine. The Annual Excursion to Redcar was greatly enjoyed. Club roll: 56. *Secretary*: N. Middelton, 14, Victoria Avenue, Norton Hill, Stockton-on-Tees.

St. John's (Oval) M.C.—At each meeting several older members exhibit large models and explain their construction and working. Air Rifle Shooting has been introduced, this recreation proving very popular. Mr. W. J. Butler, Leader of the club, is giving an interesting series of talks on " *Chess.*" A Visit was paid to the Holy Trinity M.C., where an interesting Lantern Lecture was given on " *London's Omnibuses,*" followed by slides illustrating events in the history of the club. The Library is making good progress and a monthly bulletin of club news is published at a small charge. Club roll: 17. *Secretary*: L. G. Butler, 46, Smith St., Camberwell, London, S.E.5.

Sittingbourne Pioneer M.C.—Table-tennis Tournaments have been held with great success. In a recent Model-building Contest the best entry was a Pithead Gear constructed by the youngest member of the club. In preparation for the Sale of Work a large Bridge was constructed. A double Hornby Track was laid down and on it the necessary Meccano parts were transported to the site by the club haulage contractor. Club roll: 8. *Secretary*: J. Hampshire, 2, Charlotte St., Milton Regis.

King's Lynn M.C.—At present members are generally interested in Tennis, Shooting and Rowing, but regular Model-building Evenings continue to be held. The club Layout also is being taken up and relaid as a double track. Club roll: 10. *Secretary*: J. P. Smith, Carleton Lodge, The Chase, King's Lynn.

Heywood Central School M.C.—Mr. J. P. Lunt, B.Sc., Headmaster of the School, has kindly agreed to become President. An Exhibition of Meccano models and a Concert has been held. The models on view were greatly admired by visitors, who also enjoyed the Concert, which included the performance of a play. A Lantern Lecture on "*London*" was given by the Leader, Mr. G. N. Chaplin. Club roll: 43. *Secretary*: C. Johnson, 6, Holland St., Heywood.

Hendon M.C.—Motor Racing Evenings are held regularly. The models are grouped in sections according to size, and exciting races are held over a standard course on which cars are timed. In a Mock Trial, the prisoner was charged with pretending to be a ghost in order to frighten the members, and was sentenced to one year's club room sweeping! Air Gun Shooting has been introduced. A party of members visited Hendon in order to attend the meeting of the British Outboard Racing Club. Club roll: 15. *Secretary*: A. Needell, 1, Sunningfields Crescent, Hendon, London, N.W.4.

Wallington County School M.C.—Lectures and short talks by members on " *Lighthouses,*" " *Newspaper Production,*" " *Railways* " and similar subjects have been given. Model-building Competitions have been held, in which each competitor is required to build a model assigned to him by lot. The Surbiton Waterworks have been visited, and members were interested in the new Southern Railway line from Sutton to Wimbledon, over which they travelled. Club roll: 15. *Secretary*: H. Bond, " West View," Plough Lane, Wallington.

Sligo (Ireland) M.C.—In preparation for a special Meccano week several large club models were built. At an Open Evening a play was performed by members, proceeds being devoted to the purchase of a Meccano Steam Engine. A Cycling Section has been formed and runs are arranged regularly. Club roll: 14. *Secretary*: K. McMenamin, 78, John St., Sligo.

Orwell M.C.—Talks have been given on " *The History of Flying* " by Mr. D. H. Sands, President of the club, and " *The Motor Car* " by Mr. T. Ronald, who gave demonstrations on a model built by himself and the Leader. Other talks have dealt with " *Coal Mining,*" " *Stamps* " and " *Submarines.*" A Social Evening concluded the last session, when the Leader was presented with a Fountain Pen. An Electric Railway and a Bagatelle Table contributed to the evening's enjoyment. Club roll: 40. *Secretary*: Miss E. Hepburn, Rutherburn, Milnathort.

Do you ever help Mother?

"Why yes, of course I help Mother. I run errands and do all sorts of things."

Quite so, but here's a way you can help Mother without any trouble to yourself at all, and yet help her in the most important way of all.

Keep yourself as fit and well as you can! Mother doesn't want any better help than that. And there's no better way of keeping fit and full of energy than by having "Force" every morning—and for supper too.

"Force" is the food that makes you grow big and strong, because it is *Whole* Wheat cooked ready to eat—wheat full of wonderful vitamins.

If you do not already have "Force" and milk for breakfast, surprise Mother by sending for a *Free* sample. All you have to do is to fill in the coupon below and send it to Sunny Jim.

"FORCE"

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EMPIRE PRODUCE - MADE IN CANADA

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Fill in your name and address and send this to: "SUNNY JIM," Dept. Z, 197, GT. PORTLAND STREET, LONDON, W.1, and you will receive in return a FREE SAMPLE OF "FORCE."

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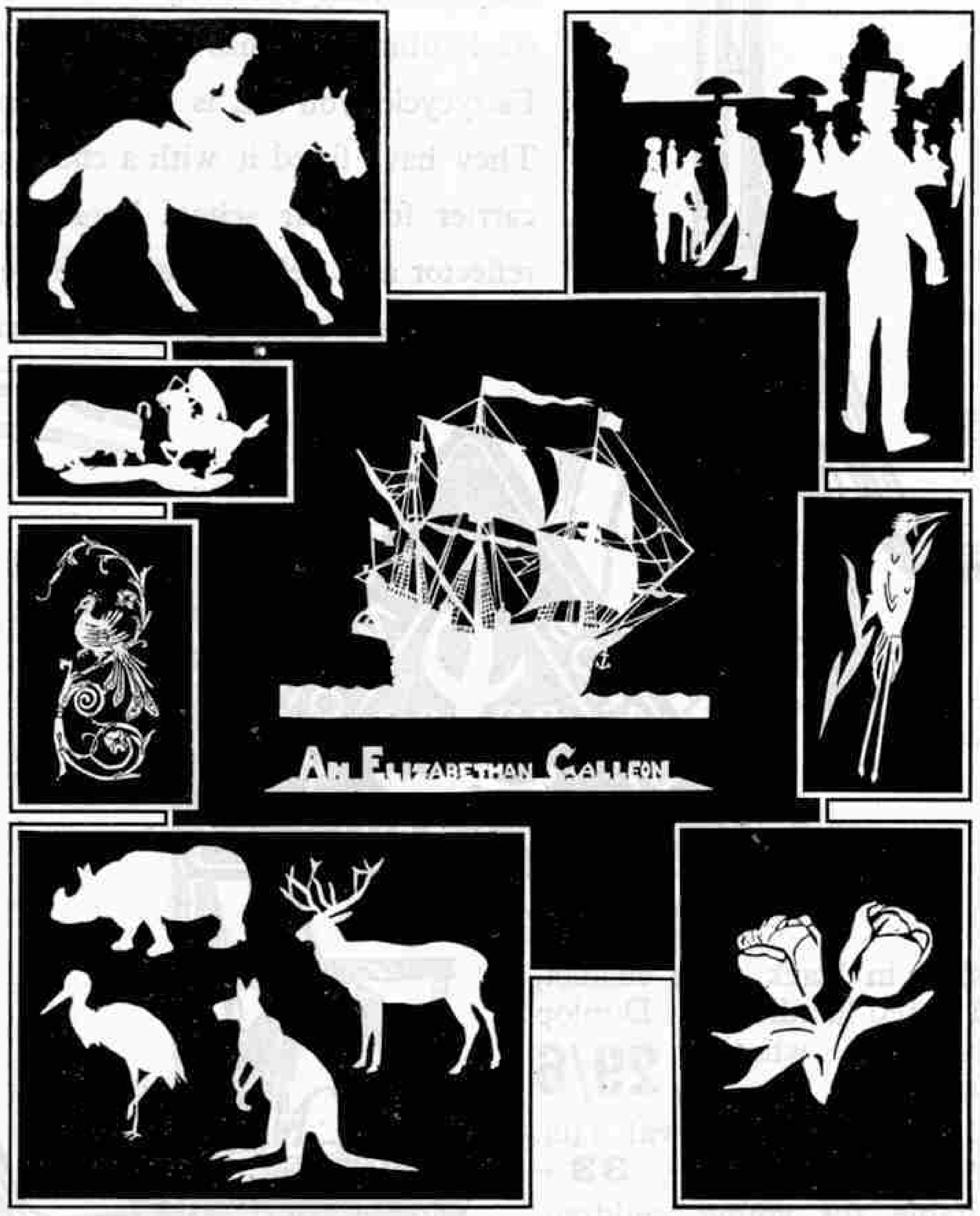
Competition Page

"CUT-OUTS No. 2"

WITHIN a few days of publication of our May issue, cut-outs of all kinds commenced to roll merrily into the Editorial sanctum: big cut-outs, small cut-outs, plain cut-outs, intricate cut-outs, black cut-outs on white grounds, white cut-outs on black grounds, and, in fact, all our work was "cut out" to provide accommodation for the flood of entries. So popular has the competition proved that we feel sure that another contest immediately is the only satisfactory way of meeting the enthusiasm.

The illustrations shown here, picked, by the way, from the early entries to the May competition, will enable new readers to grasp the idea of the competition. These specimens demonstrate very clearly the really excellent results that can be achieved. It will be seen that simple objects and grouped subjects, human beings, birds, flowers—in fact, anything—can be reproduced in a most pleasing manner.

Bold and delicate subjects can be reproduced with equal ease, although it will be found that heavy masses of black or white, unrelieved by a touch of light or shade, do not show up very effectively. A certain amount of pattern on the outline is necessary to suggest the curves and lines that are hidden by the silhouette effect of the cut-outs.



A selection of interesting entries from the May "Cut-Outs" Competition: Horse and Jockey, J. D. P. O'Leary; Old World Cricketers, Miss A. Oldroyd; Buffalo Hunt, J. White; Elizabethan Galleon, Wm. Stewart; Heron, M. Holland; Peacock, C. H. McCaill; Animals, C. Bentley; Tulips, T. Saddler.

The requirements of the competition are so simple that every one who can wield a pair of scissors, or a penknife, may take part, and produce really interesting pictures. There is a wonderful scope for originality and we look forward to receiving an even bigger entry for this second contest than for the first.

The entries will be divided into two sections, A for those aged 16 and over, B for those under 16, and prizes of Meccano or Hornby Train products (to be selected by the winners) to the value of £1/1/- and 10/6 respectively will be awarded to the best and second-best entries in each section. In addition there will be a number of consolation prizes.

It is usually a condition of our "art" contests that the entry throughout shall be the sole work of the competitor, but as young boys rarely are skilled in the use of scissors or penknives, it is permissible for entrants in the B section to enlist the aid of Mothers or sisters in the actual cutting out. The preliminary arrangement of the design must be the competitor's own work, however.

The conditions of this contest are varied slightly from the previous one, to permit competitors to make their cut-outs on black or white paper, and mount them on white or black paper accordingly, if they wish to do so. It is not compulsory to mount them, however.

Entries should be addressed to "Cut-Outs No. 2, Meccano Magazine, Binns Road, Old Swan, Liverpool," and sent to reach this office not later than 31st July. Overseas closing date, 31st October.

Every competitor must write his name, age and full address on the back of every entry submitted by him.

Competitors may have their entries returned if a stamped addressed cover of suitable size is sent for the purpose at the time of submitting the entry.

July Photographic Contest

In accordance with the announcement in our April issue, our photographic contests this year do not require competitors to submit photographs of any special subject, and the monthly contests are simply for the best photographs submitted each month, irrespective of their subjects.

The entries to the competitions will be divided into two sections, A for those from readers aged 16 and over, B for those from readers under 16. Prizes of photographic materials or Meccano products (to be selected by the winners) to the value of 21/- and 10/6 respectively will be awarded to the best and second-best entries in each section.

Each competition will be known under the name of the issue in which it is announced. Thus all entries sent this month should be addressed to "July Photo Contest, Meccano Magazine, Binns Road, Old Swan, Liverpool." They must reach this office not later than 31st July. Overseas, 31st October.

COMPETITION RESULTS

HOME

Football Improbabilities.—1. L. G. Butler (Camberwell, S.E.5); 2. W. H. Mittins (Swindon); 3. A. E. Wood (Rotherham); 4. J. D. P. O'Leary (Bromsgrove). Consolation Prizes: C. Clarke (Bristol); J. Croft (Grimsby); S. R. Davidge (Stoke Newington, N.16); R. Groombridge (Tunbridge Wells); N. E. John (West Bromwich); G. S. Marsh (Blackpool); F. J. Pearce (Wolverhampton); D. T. Veall (N. Kensington, W.10).

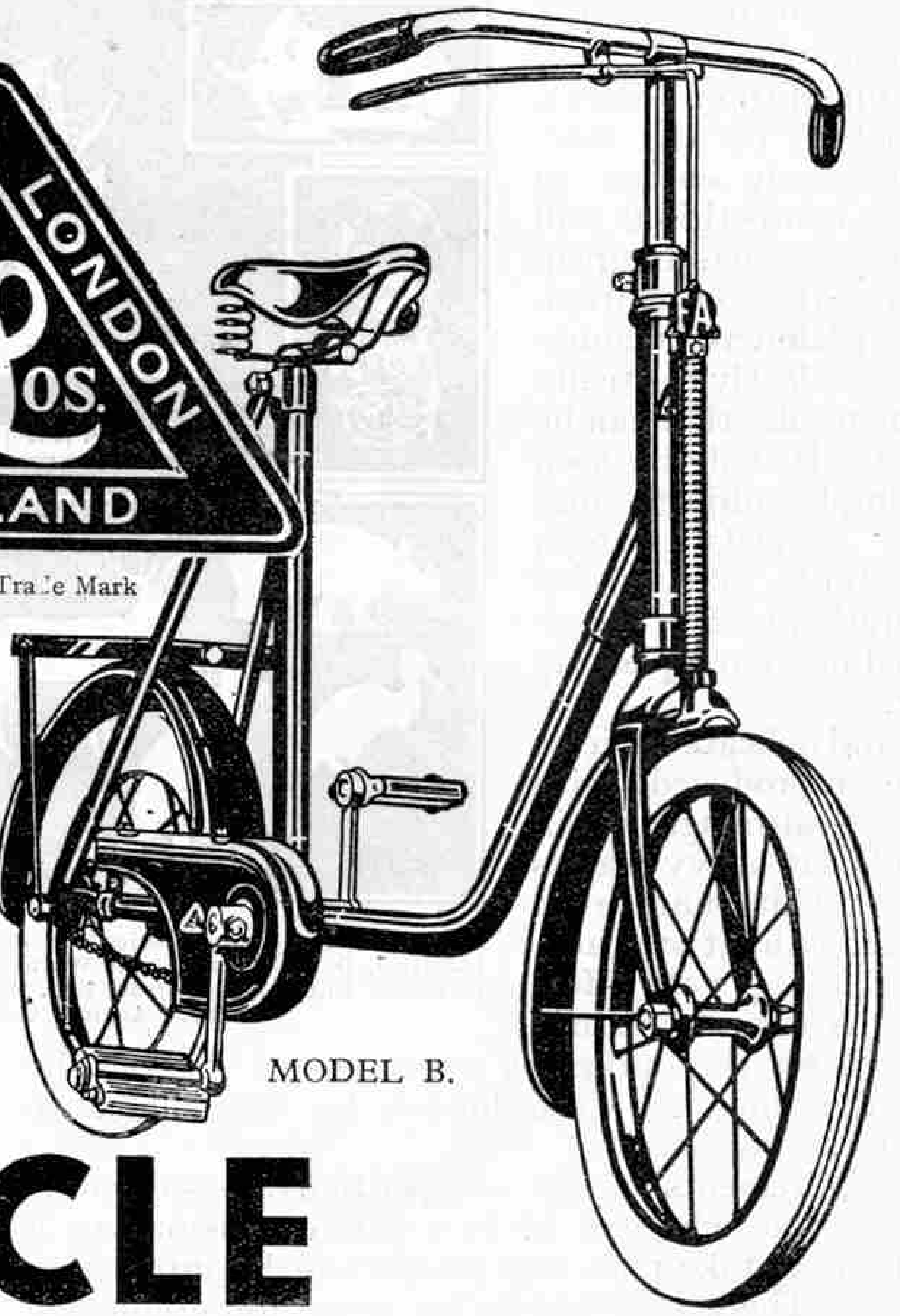
Boys! Here's your idea of a bike

Here is the Fairycycle. What a handsome bike! Glittering plated handlebars and glossy enamelled frame. What a sturdy bike! Yes, it's built of steel tubing and has tangent spoke wheels. The Fairycycle, you see, is made by skilled engineers. They have fitted it with a chain-guard, a stand, a carrier for your school books and, of course, a reflector and bell. These engineers say: "That's our idea of a good bike." Now isn't it also yours?

MODEL A.

L. BROS. LTD. LONDON ENGLAND

Regd. Trade Mark


MODEL B.

MODEL A—Well finished in black cycle enamel, ball-bearing pedals and plated handlebars. Dunlop saddle, 12in. tangent spoke wheels, ⅝in. rubber cushion tyres - - - **29/6**

Model Ax.—Like Model A, but larger size, with 14in. wheels and ⅝in. rubber cushion tyres - - **33/-**

MODEL B.—Very suitable for young children, being light and easy to ride. Has 12in. tangent spoke wheels with ⅞in. rubber tyres. Complete with chain-guard, reflector, stand and carrier **39/6**

Model Bx.—As Model B, but larger size, with 14in. wheels and ¾in. rubber cushion tyres - - **42/-**

FAIRYCYCLE

Besides the models specified above, Fairycycles are made in the following sizes at the prices stated:—

Model C.— Raised pattern plated handlebars, has chain guard, stand, carrier, reflector and bell. Cycle pattern rim brake, 12in. tangent spoke wheels, adjustable ball-bearing hubs, 1in. imitation pneumatic tyres - **49/6**

Model Cx.—As Model C, but larger size with 14in. wheels. **52/6**

Model Px.—As Model Cx, but with 14in. x 1⅜in. Dunlop "Kempshall" pneumatic tyres. **55/-**

Model D.—Cycle type brakes, raised pattern plated handlebars, 2-coil spring saddle, etc. ½in. x ⅛in. roller chain, adjustable ball bearings throughout. 12in. tangent spoke wheels with 1in. imitation pneumatic tyres, complete with chain-guard, stand and carrier, reflector and bell. **59/6**

Model 6.—Strongly built for children up to 9 or 10 years old. 16in. tangent spoke wheels, fitted 1in. imitation pneumatic tyres, adjustable ball-bearings throughout, cycle pattern rim brake, 3-coil spring saddle, tool bag, bell, etc. - - - **70/-**

Model 8. — The "Rolls-Royce" of Fairycycles, raised pattern plated handlebars, 2¼in. buttress tread Dunlop balloon tyres. Plated ball-bearing pedals, tool bag, carrier, stand, bell, reflector and pump, etc. ... **87/6**

All these models, with the exception of Models A and Ax are finished in black or blue, with gold lines.

FAIRYCYCLE ASSOCIATION

Membership free to owners of genuine Fairycycles and badge attached to every machine. Fill up the form when you buy your Fairycycle, post it to Lines and you will then become a member. The badge is shown on the bicycle.

Fairycycles can be obtained at all good toy shops, or illustrated leaflet will be sent on request.

LINES BROS. LTD., MORDEN ROAD, MERTON, LONDON, S.W.19

Fireside Fun

REST IN VIEW

Husband: "I'm afraid this place is a little too dear for us."

Wife: "But it's perfectly lovely! The view from this balcony is so fine that it leaves me speechless."

Husband: "Then we'll buy it!"

* * * *

Foreman: "Here now, Murphy, what about carrying some bricks?"

Murphy: "I ain't feelin' well, guv'nor. I'm trembling all over."

Foreman: "Well, then, lend a hand with the sieve."

* * * *

Diner: "Two eggs, poached medium soft; buttered toast, but not too hard; coffee, not too much cream in it."

Waiter: "Yes, sir. Would you like any special design on the dishes, sir?"

* * * *

Teacher: "How can you tell an old chicken from a young one?"

Mary: "By the teeth, miss."

Teacher: "But chickens have no teeth."

Mary: "No, miss, but I have."

* * * *

"Did you hear that when old Jones returned from abroad he fell on his face and kissed the ground of his home town?"

"Emotion?"

"No; banana skin."

* * * *

He had visited eleven house agents during the same afternoon without hearing of a house to suit him.

"I am looking," he told the twelfth agent, "for a house that is at least five miles from any other."

"I see, sir," said the agent, with a smile. "You want to practise the simple life, I presume?"

"No," he replied, "I want to practise the saxophone."

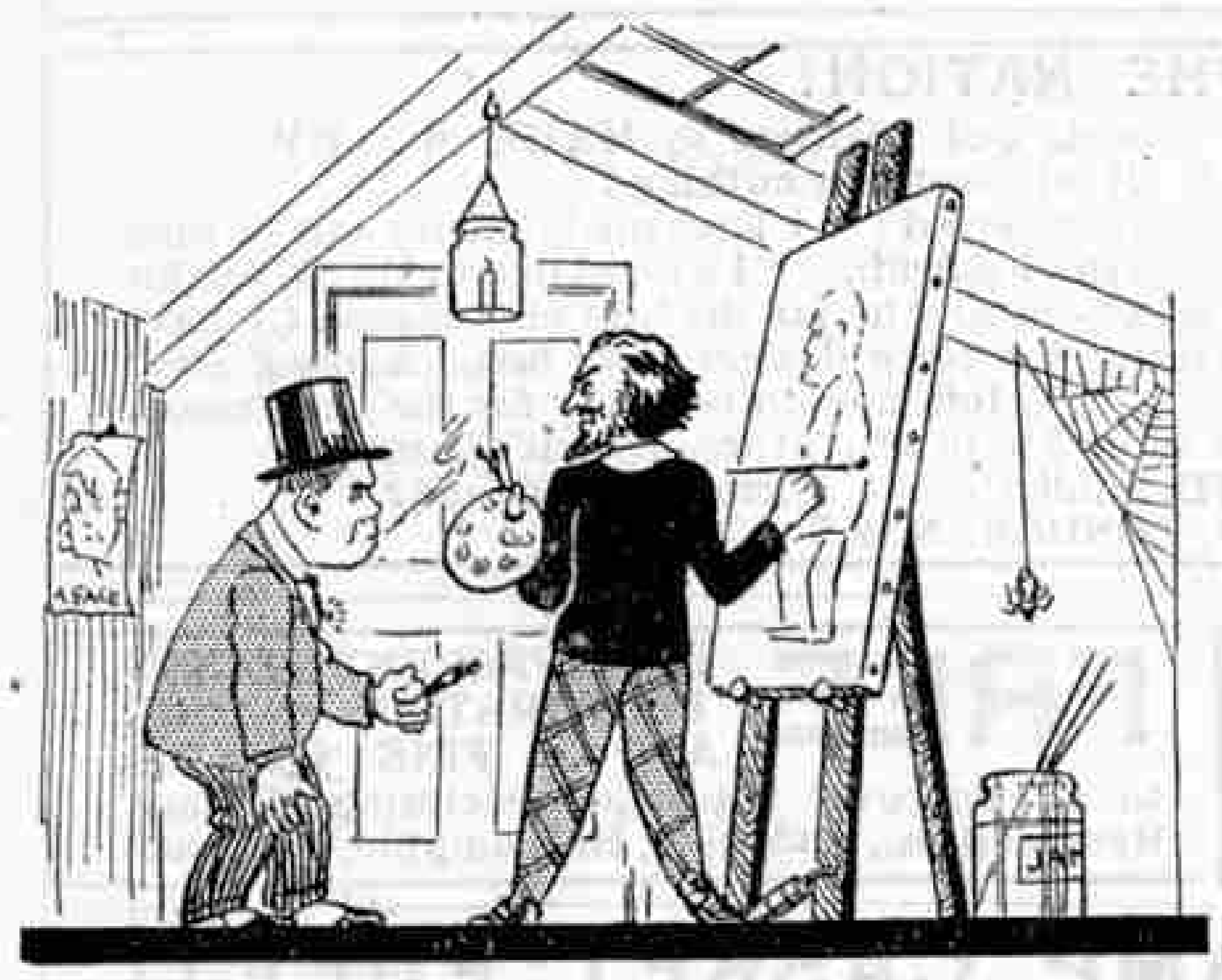
* * * *

Job hunter: "Have you an opening for a bright young man?"

Busy Manager: "Yes, but don't slam it on your way out!"

* * * *

RIGHT BOTH WAYS



Artist: "What do you think of your portrait?"

Patron: "It could be worse."

Artist: "Sir, I hope you will withdraw that statement."

Patron: "Very well. It couldn't be worse!"

* * * *

Nurse: "Another patient for you, doctor—a victim of congestion."

Doctor: "Of the lungs?"

Nurse: "No, of the traffic."

* * * *

"Whatever have you been doing, Mary?" exclaimed Mummy. "You are all over ink!"

"No—no I'm not," sobbed Mary, "the ink's all over me!"

TOO MANY TO COUNT

The sergeant-instructor was trying to make a newly-joined Air Force mechanic understand that there are one hundred hundredths to an inch. After he had spent nearly an hour in explaining the matter from every angle, he thought the man had at last definitely grasped the idea.

"Well, now," he demanded, finally. "Tell me, how many thousandths are there in an inch?"

The mechanic paused and scratched his head.

"Goodness, sergeant, there must be millions of 'em," he replied.

* * * *

During the hearing of a case a man began clattering about in the back of the court room, pushing over chairs and generally upsetting things.

"Young man," said the judge at length, sternly, "you make a great deal of noise."

"Your Honour," came the reply, "I have lost my overcoat and I am looking for it."

"Well, well," snapped the irate judge, "people often lose whole suits here without making so much disturbance."

* * * *

CO-OPERATION

The novice had ignored the point constable's signal, driven his car to the wrong side of the road, and caused a tightly-packed traffic jam.

"Do you know *anything* about traffic rules?" irately demanded the exasperated policeman.

"Why, yes," said the driver, getting his "Safety First" booklet out of his pocket. "What is it you want to know?"

* * * *

Old Lady Passenger (six hours out): "Oh, Captain, I've heard that wireless affects the weather. Do you think I'll bring on a storm if I send one teenie-weenie message of six words to my niece?"

* * * *

Navvy: "Have you got a job for me?"

Foreman: "No, but I've got a man here who hasn't turned up yet, and if he doesn't come to-morrow I'll send him home and you can take his place."

* * * *

Boy: "I want to ask you a question."

Father: "What is it?"

Boy: "If the Egyptians wrote on stone, did they need a hammer to break the news?"

* * * *

1st Sportsman: "Any luck?"

2nd Sportsman: "Yes, shot 20 ducks."

1st Sportsman: "Were they wild?"

2nd Sportsman: "No, but the farmer who owned them was."

* * * *

"That's a nice bit of fish, ma'am!" said the salesman, persuasively, "best 'ome-cured!"

The thin-lipped female sniffed contemptuously.

"Is it, hindeed?" she said. "Then just you take it away and give me one wot ain't been ill!"

* * * *

"It's all nonsense to say brown eyes denote one thing and blue another. Colour in eyes means nothing at all!"

"Anyway, black eyes usually denote something."

* * * *

"But, my dear, what do you want with another new hat?"

"A fur coat."

* * * *

Tommy was taking his puppy out for a walk when it playfully caught hold of a lady's skirt.

"Call your dog away," cried the lady, indignantly.

"I daren't," replied Tommy, "his name is Cæsar."

TAKING HIM DOWN

First Nature Lover: "That electrical engineer was sneering at our waterfall. He said it isn't what it used to be."

Second Ditto: "What did you reply?"

First Nature Lover: "I told him to stop making light of it."

* * * *

Two Scotsmen were climbing a difficult peak in the Highlands. One succeeded in reaching the top, but his companion became wedged in a bad place. "You hang on there, Sandy," called out the man at the top, "and I'll go back to the village for a rope."

The rescuer returned an hour later. "Are you there yet, Sandy?" he shouted. "It's no good. They want half-a-crown for the rope."

* * * *

An elementary school teacher had a pupil who always said, "I have went."

He was told to remain after class and write one hundred times "I have gone."

In the morning the teacher found this note: "I have wrote 'I have gone' one hundred times, and now I have went home."

* * * *

A young lady entered a drug store and asked for a pound of floor wax.

"I'm sorry, Miss," replied the assistant, "we only sell sealing wax."

"Don't be silly," she remarked, "why should anyone want to wax a ceiling?"

* * * *

"Are you sure," asked the old lady, "that this century plant will bloom in a hundred years?"

"Positive, ma'am," answered the florist. "If it doesn't, bring it right back and we'll change it for you."

* * * *

The Poet: "Have you sold much this month?"

The Artist: "Yes, two suits and my best armchair."

* * * *

Alf: "I see that old lady give you somethink for helpin' 'er across the road. Wot was it?"

Bill: "When we got across, she said ''ere's something for a cup of tea.'"

Alf: "Yus, but wot did she give yer?"

Bill: "A lump of sugar."

* * * *

"Hi, Sparks!" called the puzzled electrician to his youthful assistant, "put your hand on one of these wires."

Sparks did as he was told.

"Feel anything?"

"No," replied Sparks.

"Good!" said the electrician. "I wasn't sure which was which. Don't touch that other wire or you'll be electrocuted."

* * * *

GOOD ENOUGH FOR THE CAT

Street Artist: "Excuse me, mum, but I wish you would keep your cat in the house. I've drawn a salmon four times and every time the cat has licked it out."

* * * *

Judge: "What name?"

Humorous Aviator: "Angel, sir."

Judge: "Where did you come from?"

Aviator: "Heaven, sir."

Judge: "Well! How did you get here?"

Aviator: "Slid down a rainbow, sir."

Judge (grimly): "Well, take six months for skylarking."

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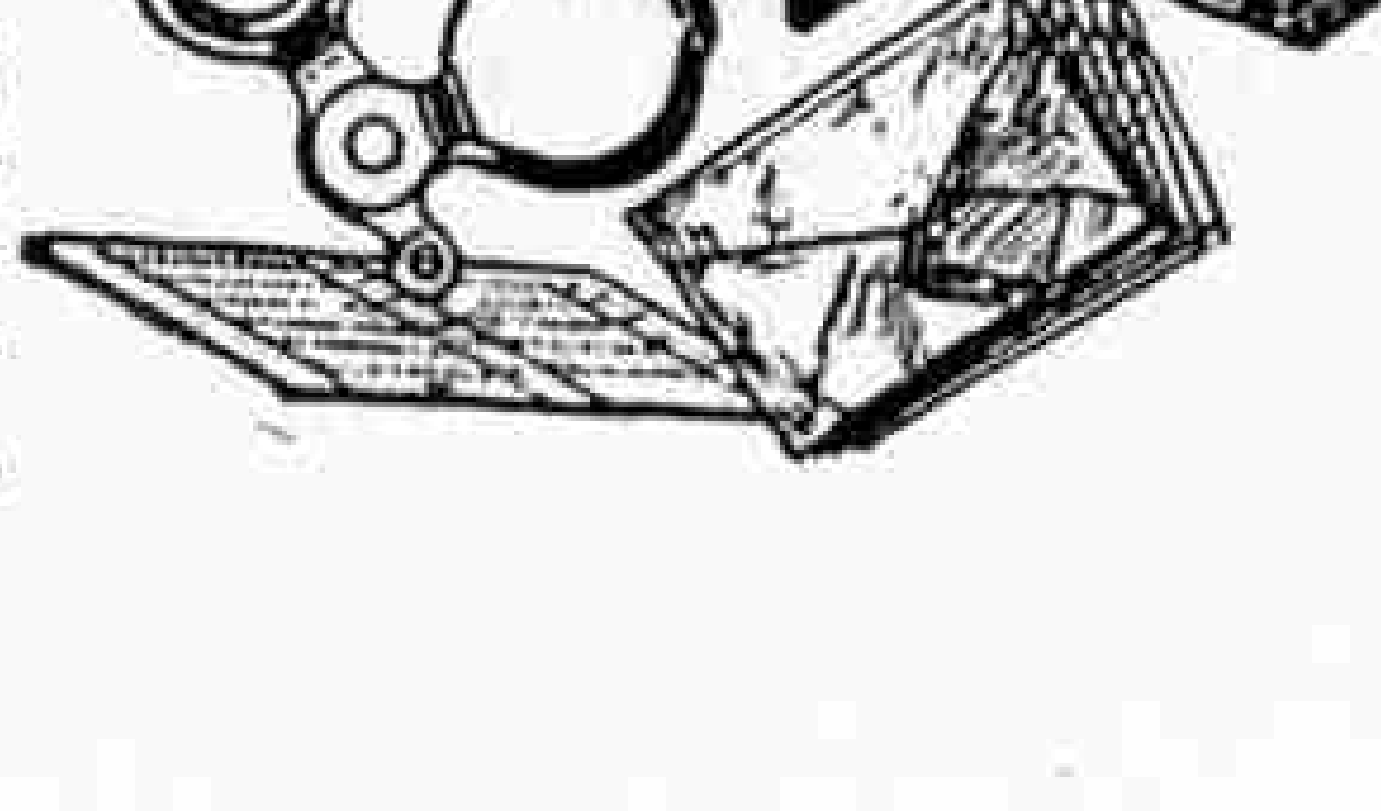
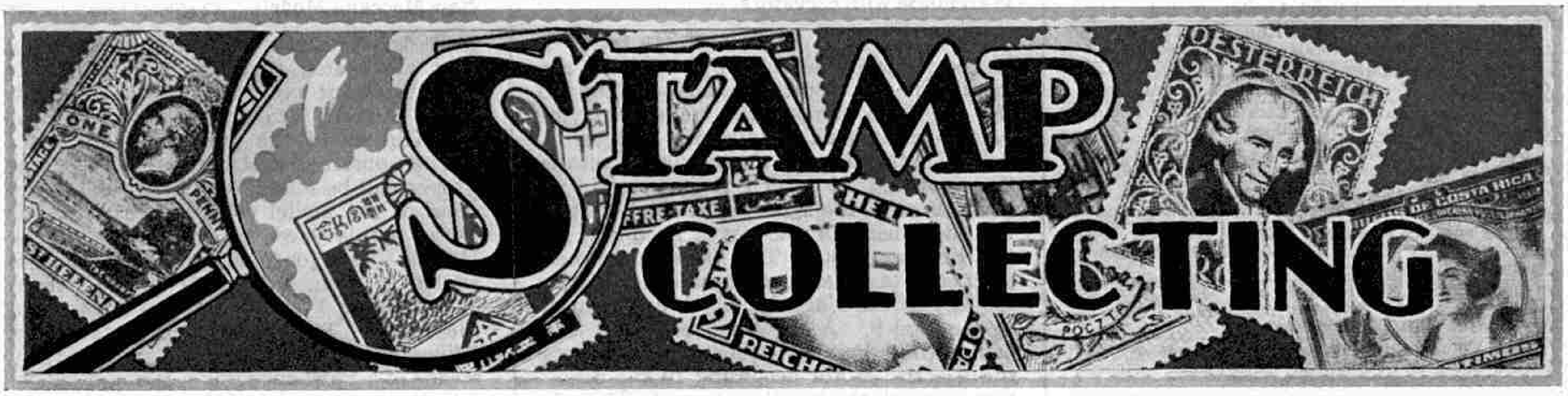
VICTOR BANCROFT, MATLOCK, ENGLAND.

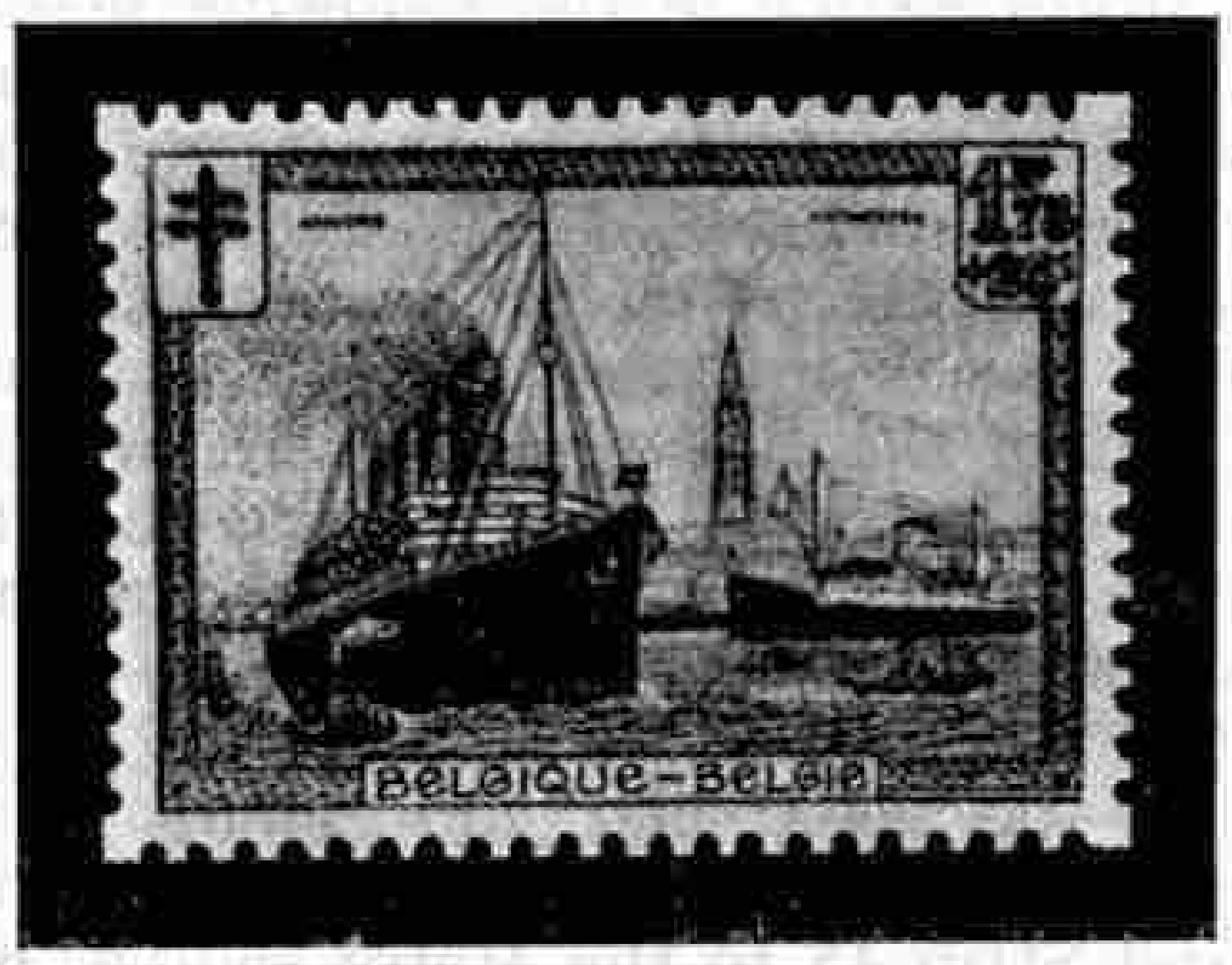




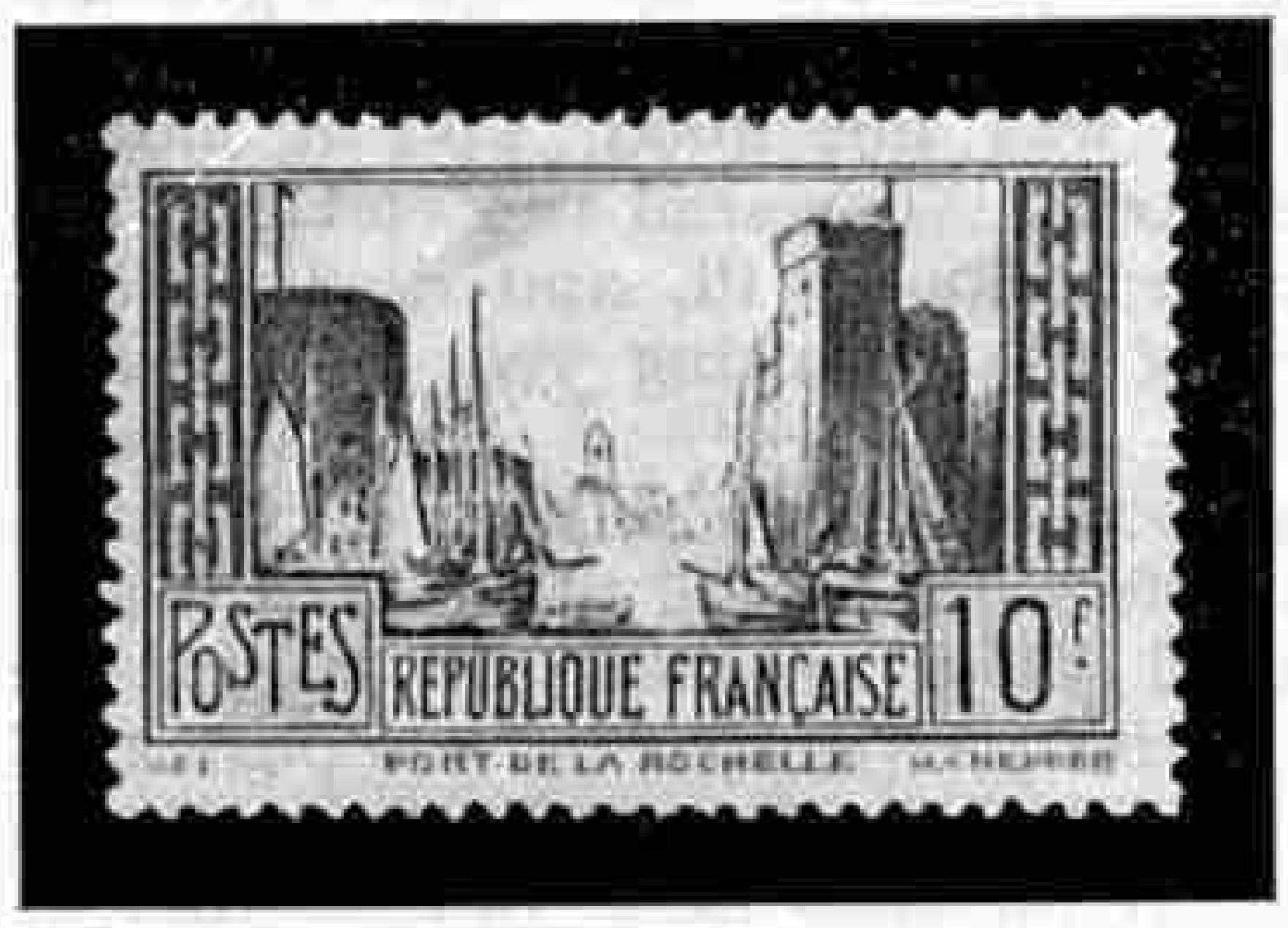
STAMP PORTS OF THE WORLD

POSTAGE stamps, ships and sea ports are all essential cogs in the smooth-running wheel of international trade. The absence of any one of them would immediately impair the efficiency of the others. It is well, then, to know something of them, and the student of stamps in his search for knowledge of ships and sea ports will find nothing handier than the illustrations available in the pages of his album. We dealt with ships in the June *"M.M.,"* and this month an imaginary world cruise, in the course of which we call at the stamp ports and harbours, will provide a most interesting pastime. Unfortunately, it will not be possible to illustrate all the stamps to which reference is made or, if our route is to be practical, to call at certain places that might well be illustrated.

Our tour starts at Riga, the capital of Latvia, and a famous port in the Baltic Sea. A splendid view of the city of Riga and of its shipping is given on the 30 santimu value of the attractive Latvian set, issued on 18th November, 1928, in celebration of the 10th anniversary of Latvia's independence.

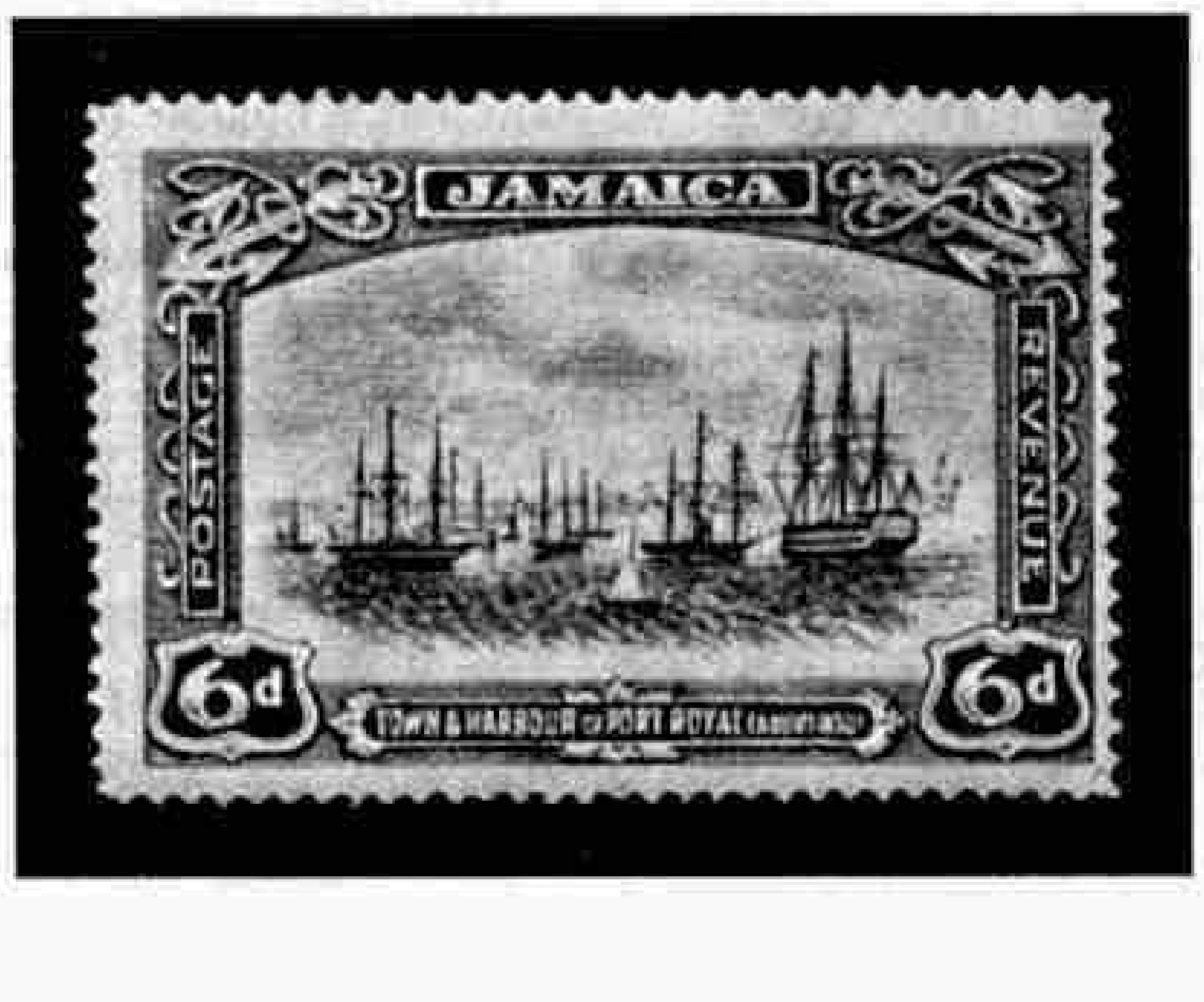


Our course lies through the North Sea and our first call must be at Antwerp, on the River Scheldt, chief port of Belgium and one of the six greatest ports in the world. The 1f.75 value of Belgium's Anti-tuberculosis charity issue of 1929 provides our illustration, easily the gem of the collection. It gives a splendid view of the harbour and shipping, and, in the foreground, one of the great ocean liners that use the port as their base. Providing accommodation for the largest ocean vessels, Antwerp docks have a water area of more than 750 acres and quayside accommodation over 41,000 yards in length. The dockside equipment is modern in every respect and includes 550 hydraulic and electric cranes and 11 floating cranes, one capable of lifting 150 tons, 22 grain elevators, each with a capacity of 200 tons per house, and 229 petroleum storage tanks with a total capacity of 333,238 cubic yards.



The next stage of our cruise takes us away across the North Atlantic to Newfoundland where we touch Hearts Content, featured on the 8c. value of Newfoundland's beautiful current issue. Pictures of the sea front of St. Johns, Newfoundland's principal port, unfortunately, are not available, although the current issue shows several general views of the city itself. On the 6, 9, 12 and 20c. values, respectively are shown a modern skyscraper hotel, the Cabot memorial tower, the War Memorial, the General Post Office and the Colonial Office building.

Standing off from the North American coast, we sail south to the West Indies, where our first call is at Jamaica, of which Kingston is the chief port. There is no available stamp view of Kingston Harbour, but Port Royal harbour, through which vessels proceeding to Kingston must pass, appears on the 6d. denomination of Jamaica's 1921-3 issue. The view shows the harbour as it appeared in 1853 and strikes an interesting contrast with our other illustrations, all of which depict modern shipping. Kingston itself provides an excellent harbour with a depth of water alongside its wharves sufficient to accommodate the largest of vessels.

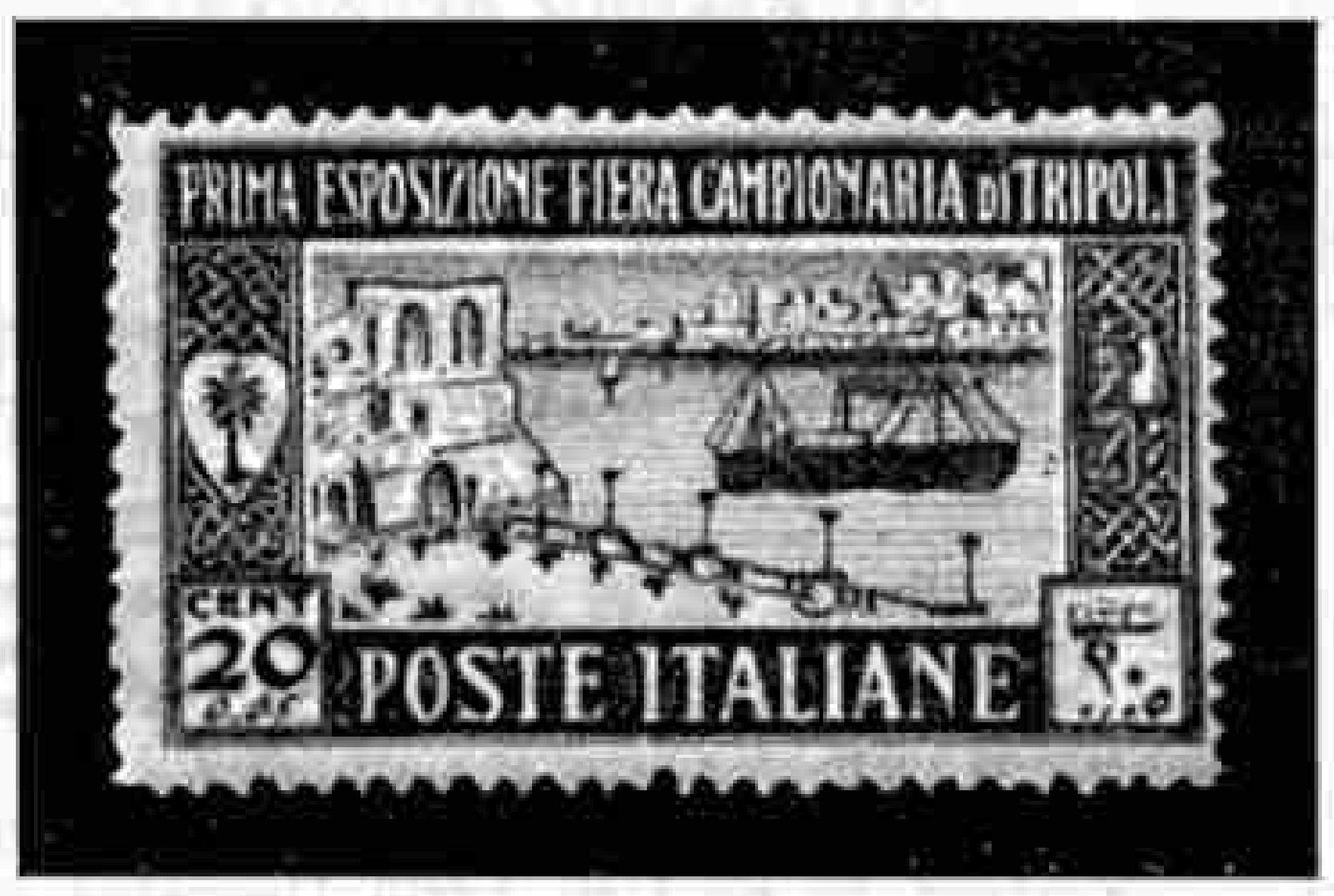


Our course now lies across the Caribbean Sea to the group of small West Indian islands known as the Lesser Antilles, where, on the southern side of the isthmus linking the two portions of the French island, Guadeloupe, we shall find Pointe-à-Pitre, the harbour of which is shown on the higher values of the Guadeloupe 1905-7 pictorial issue.

From the West Indies, we sail down the Eastern Coast of South America, until we reach the mouth of the Rio Para and drop anchor at Para, one of the principal Brazilian ports, illustrated on the 100 reis value of Brazil's commemorative issue of November, 1915. The stamp was issued to celebrate the tercentenary of the founding of the port, and shows a composite view representing the maritime discovery of Cape Frio and a scene in the modern port.

Our next port of call is Montevideo, the Uruguayan port on the Rio de la Plata. The great sweep of the river is splendidly shown on the stamps issued on 25th August, 1909, to celebrate the opening of the port, which, of course, is famous as a centre of the South American cattle trade. A few miles further up the river, on the opposite bank, is Buenos Aires, the capital of Argentina. No view of the port is available, unfortunately, and we must sail on to Rosario, some 150 miles further up-stream on the south bank of the River Parana, before we encounter an Argentinian stamp port.

Again we are indebted to a commemorative issue for our illustration, the stamp in this instance being taken from the Argentine issue of 26th October, 1902, celebrating the completion of the dock at Port Rosario. The port is well equipped with some 50 or 60 electric cranes of varying capacities and a floating crane that is capable of lifting loads up to 35 tons.


PRIMA ESPOSIZIONE FIERA CAMPIONARIA di TRIPOLI
CENT
20
POSTE ITALIANE

And now our course lies eastward across the South Atlantic to Cape Town in South Africa. The 10/- value of the current series gives a splendid impression of the harbour of Table Bay and of Table Mountain in the background. Leaving Table Bay we round the Cape of Good Hope and embark on one of the most pleasant sections of our tour, up the coast of East Africa to Beira, Portuguese East Africa, some 1,450 miles north.

Beira is the chief port of entry for Nyasaland and Southern Rhodesia, and, with the rapid development of those two British colonies, the trade of the port is growing apace. A splendid impression of the wharves and harbour is obtained from the 5c. stamp of the Mozambique Company's 1914-28 issue, an issue that is, by the way, one of the most interesting pictorial sets in the whole of the big Portuguese range. It provides a complete review of the intensive activities of this colonising company.

All loading and unloading of ocean-going vessels at Beira is done by lighters that can handle 4,000 tons per day,

(Continued on page 581

300 FOREIGN, including Persia, Siam, China, 4d.—Cranwell, 11, Dawpool Road, London, N.W.2.

150 DIFFERENT STAMPS FREE. Send for ½d. Approvals.—Cox, 135, Cambridge Road, Seven Kings.

SUPERIOR STAMPS. 200 1/–, all different.—J. Gillie, 12, Belle Vue Villas, East Boldon, Durham.

145 Free, including Senegal, Kiautschou, etc. Request Approvals.—"Atlas," 27, Bedford Rd., E.17.

Look ! 250 different Stamps free to genuine approval applicants.—Thomson, 184, Newhaven Rd., Edinburgh.

25 Cleaned Stamps Free. Send for ½d. and 1d. Approvals.—Miss Williamson, 18, Victoria Park, Dover.

Write and ask to see my approval selection. Free gift with every application.—S. Miller, 87, Lower Northdown Road, Margate.

100 DIFF. STAMPS FREE ! ! Send 1½d. and ask for Approvals of your favourite countries.—N. Upson, 32, Norman Road, Canterbury.

Real Value at lowest cost. Ask to see my 600 British Colonials at halfpenny each stamp.—Bickers, Lordswood Avenue, Southampton.

BOYS. STAMP COLLECTORS. Here's a chance. Breaking up Big Collection. Packets containing 100 Stamps, picked at random, sent post free on receipt of 1/– P.O. to box 701A.

I GIVE NOTHING AWAY FREE, therefore I can sell you better quality approvals, genuine sets and packets. Send 3d. and state which you require.
BAILEY, 26a, Richmond Road, Southampton.

Persia Air Post, Greece Centenary, Morocco, New Finland and Bulgaria, Monaco, Syria, Lebanon, Alaouites, Luxemburg, Cochin, Paraguay, B. Congo, China, Ten Colonials, 6d. post free. If you wish to see cheap modern stamps ask for selection.
J. R. MORRIS, 9, Audley Road, Folkestone, Kent.

FREE AND
1. 50 DIFF. FRENCH COLONIALS
2. SET OF 12 DIFF. AUSTRALIA
to all genuine approval applicants.
WADE (Dept. M.), 2, Kingsthorpe Rd., Sydenham, Kent.
POST FREE

ENGLISH £1 AND 10/- STAMPS.

These two stamps (issued and used for a special purpose) with eight others, including one nearly **90 YEARS OLD** and other **OLD** English postage stamps **GIVEN AWAY** free of charge to genuine applicants for selections of duplicate stamps on approval.
HENRY TURNER,
110, Barnett Road, Preston, Brighton, Sussex.

FOR FIFTY YEARS

we have been sending out sheets of stamps on approval. Every stamp we sell is fully guaranteed, is specially selected and priced at the lowest possible figure. Ask for some to be sent you for inspection.

For 30 days (abroad 90 days) we will present absolutely free to all applicants enclosing 1½d. for postage a beautiful **first issue Costa Rica** stamp if the application is addressed to—Department 50,
ERRINGTON & MARTIN, South Hackney, London, E.9.
Established 1880.

Have You Seen Them?
MY RECORD APPROVALS.
Huge discount of 8d. in 1/– allowed, or 9d. in 1/– for a nett purchase of 2/6 or more. My approvals being **absolutely the cheapest and best, no free gifts** are given.
RECORD STAMP COMPANY,
23, Canning Road, East Croydon.

"DIAMONDS"
MANY RARE STAMPS have been found by purchasers of **The "DIAMOND" Packet,** which is guaranteed to contain 1,000 Unsorted Stamps from Convents abroad, **1/3.** 2 packets **2/5 ;** 3 packets **3/6 ;** 4 packets **4/6 ;** 5 packets **5/6.** All post free. (Abroad 3d. per pkt. extra).
O. NERUSH, Importer
(Dept. E), 68, Turnpike Lane, Hornsey, N.8.

1000 DIFFERENT STAMPS 1000
ON APPROVAL
from which you may select any 100 for 3/–. This selection is **not** made up of the thousand commonest stamps, but contains specimens priced by Stanley Gibbons up to 1/– each. For 3/– you have the opportunity of choosing 100 stamps of the catalogue value of 20/– or more.
H. HARDY, 285, Archway Road, London, N.6.

WRITE FOR OUR WORLD-FAMOUS APPROVALS AND OBTAIN STAMP OUTFIT
FREE. Comprising STEEL TWEEZERS, DUPLICATE ALBUM, PERFORATION GAUGE, 100 STAMP MOUNT HINGES, and a Packet of
75 SELECTED All Different STAMPS.
Send 2d. Stamp for Packing, etc. (Overseas 4d.) **(Without Approvals, Price of Outfit, 9d.)**
R. WILKINSON, TRINITY STREET (W.), LLANDUDNO. (Late of Colwyn Bay).

Warehouse with Elevators—

(*Continued from page 553*)

be varied considerably by altering the length of the rotating arms—adding to the length to increase the travel and vice versa—or by using additional Pulleys.

In the model, as in an actual lift, means are provided by which it is possible to start or stop the Motor and thus control the movement of the cages from any of the landing floors. This is accomplished by means of the control handles 10 (Fig. 2, see last month's article) which are secured to the Rod 9. A slight movement of any one of these handles either stops or starts the Electric Motor according to the direction in which the handle is turned. Threaded Pins 10 screwed into Collars form the handles.

The Rod 9 consists of two 11½" and one 5½" Rods connected together by means of Couplings. At its lower end it is journalled in a Double Arm Crank that is bolted to one of the transverse Angle Girders in the base as shown in Fig. 2. The Rod 9 extends from top to bottom of the Warehouse and is connected at its upper end with the Motor switch in the following manner.

The upper end of the Rod is journalled in a 1½" Strip bolted to the Angle Girder 47a (Fig. 5) and is held in position by means of a Collar placed on the Rod against the face of the Strip. A Crank 46 secured to the end of the Rod is connected pivotally to one end of a 4½" Strip 45 and the other end of this Strip is attached to an Angle Bracket that, in turn, is pivoted to the central arm of the Motor switch. It will readily be seen that movement of the control Rod is transmitted via the Crank 46 and Strip 45 to the Motor switch, with the result that the Motor may be either started, stopped or reversed as desired.

After the mechanism has been adjusted finally the roof may be placed in position and bolted to the Angle Girders 14.

Complete instructions for building the Meccano model Warehouse with Elevators are contained in Special Instruction Leaflet No. 31. Each unit of the Warehouse structure and elevator gear is described clearly, and the construction is further simplified by the inclusion of a number of half-tone illustrations of the various portions of the model. The leaflet may be obtained from any Meccano dealer, price 3d., or direct from Meccano Ltd., Old Swan, Liverpool, price 3d. post free. Remember to ask for Leaflet No. 31.

Flashlight Photographic Contest

Those of our readers who took part will be interested to see the results of Messrs. Johnson's Flashlight Photographic Competition that closed on 30th April :

First Prize, D. ALLEN (Leamington Spa) ; Second Prize, W. A. WALLIS (Lenton, Nottingham). Six Prizes each of 10/6 : H. TAYLOR (Chelmsford) ; E. J. BULL (London, S.E.16) ; H. W. HILLIER (Maidstone) ; R. W. BARNES (Ilkeston) ; J. S. SPENCE (Edinburgh) ; G. C. BACKHOUSE (Harehills, Leeds). Six Consolation Prizes : L. MITCHELL (Sunderland) ; E. MOONEY (Burton-on-Trent) ; R. L. PLOWMAN (Enfield) ; A. E. HARDING (Leek) ; C. NEWBERRY (Hornsey, N.8) ; Miss A. DARBYSHIRE (Leeds).

Messrs. Johnson have two Daylight Paper Competitions running now, to close respectively on 31st July and 31st October. Any subject is eligible for the July competition but entries for the October competition must be Holiday snapshots.

A leaflet giving full details of the arrangements and prizes to be won will be forwarded, post free, to any reader who applies, mentioning the "*M.M.*," to Johnson & Sons (Manufacturing Chemists) Ltd., Hendon Way, Hendon, London, N.W.4.

CHOICE OF FOUR
Quality Packets. Any one of these attractive sets **Free!**
8 CASTLES and TEMPLES **6 MAPS**
6 GIRAFFES and CAMELS **8 SALVADOR**
Choose the packet which you prefer, ask to see my approvals and enclose stamp for postage.
L. STUART, 183, SHERBORNE ROAD, YEOVIL.

New Meccano Models—

(*Continued from page 559*)

Bolts to the extremities of two 4½" Strips that are bolted together face to face to form the front axle. Two 1½" × ½" Double Angle Strips 5 secure the 4½" Strips to the side Girders of the model.

The constructional details of the crane proper will be made clear from the general view of the model (Fig. 6). The load is raised or lowered by turning a Crank Handle that is journalled in Flat Trunnions which, in turn, are bolted to the flanges of the Sector Plate that forms the base of the crane. The load is prevented from falling when the handle is released by means of a Pawl engaging a Ratchet Wheel mounted on the end of the Crank Handle ; a Collar secured on the shanks of a Threaded Pin that is screwed into the boss of the Pawl, acts as a weight and keeps that Pawl in engagement with the teeth of the Ratchet Wheel.

The parts required to build the Breakdown Crane are as follows :—8 of No. 2 ; 2 of No. 2a ; 2 of No. 3 ; 4 of No. 5 ; 2 of No. 6a ; 2 of No. 8 ; 4 of No. 9 ; 7 of No. 10 ; 10 of No. 12 ; 1 of No. 15 ; 3 of No. 16 ; 3 of No. 17 ; 4 of No. 18a ; 1 of No. 19s ; 4 of No. 20a ; 2 of No. 20b ; 1 of No. 21 ; 1 of No. 22 ; 2 of No. 22a ; 2 of No. 24 ; 1 of No. 26 ; 1 of No. 28 ; 1 of No. 32 ; 8 of No. 35 ; 94 of No. 37 ; 7 of No. 38 ; 2 of No. 48 ; 1 of No. 48a ; 3 of No. 48b ; 1 of No. 52 ; 4 of No. 53 ; 2 of No. 54 ; 1 of No. 57 ; 10 of No. 59 ; 1 of No. 62 ; 3 of No. 63 ; 2 of No. 77 ; 2 of No. 90 ; 2 of No. 90a ; 4 of No. 111c ; 1 of No. 115 ; 1 of No. 116a ; 2 of No. 126a ; 4 of No. 142a ; 1 of No. 147a ; 1 of No. 147b ; 1 of No. 148 ; 2 of No. 165.

Famous Inventions—

(*Continued from page 527*)

composition of clays. He was not in any sense an expert chemist, but he had acquired a considerable chemical knowledge as a result of incessant experiments. One of his favourite expressions was "everything yields to experiment," and he repeatedly proved the truth of his words.

About the year 1790 he began a gradual retirement from business. His health at that time was not good, and it slowly became worse. Towards the end of 1794 he became seriously ill, and died on 3rd January of the following year at the age of 64.

Wedgwood was a great man in the true sense of the word. The manner in which he worked his way from apprentice to master potter proves that he was possessed of ambition and tremendous energy. He was a great business man, but his aim in life was to achieve success in his work rather than to amass money. He started out with high ideals and never lost them ; and nothing would ever induce him to produce work of inferior quality for the sake of a bigger profit. He has been well described as a man of "great heart, great mind, and great purpose."

It is interesting to note that the Wedgwood factory still remains at Etruria and is carried on by direct descendants of its founder. Its history has been singularly peaceful and prosperous, and in the 160 years of its existence there has never been a strike. Among its 900 employees there are very many whose fathers, grandfathers and great grandfathers spent their working lives in maintaining the high traditions set up by Josiah Wedgwood.

We are indebted to the courtesy of Josiah Wedgwood & Sons Ltd., for illustrations and for assistance in the preparation of this article.

Stamp Gossip

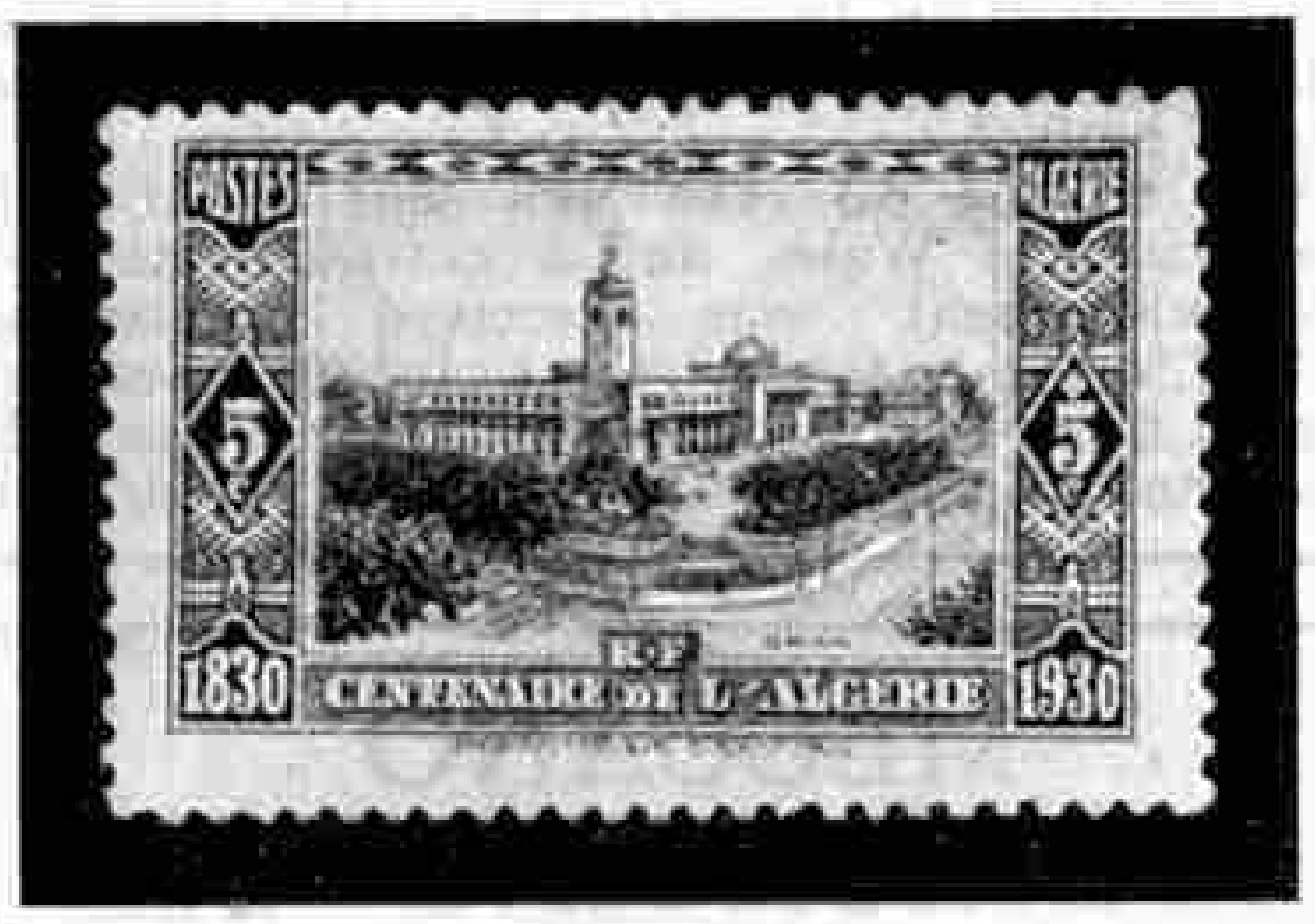
Shipping Stamps

Lack of space last month compelled the exclusion of an interesting note on shipping stamps, referring particularly to the Pacific Steam Navigation Company's issue of 1857 for the use of its Peruvian offices. As far as can be traced the stamps of this issue have three unique claims to fame: they are the only postage stamps issued by a shipping company; they showed the weight of the package they would frank; and for a few months during the early days of Peru's postal service they were adopted as the official State issue.

The issue possibly has a fourth claim to fame—that of being the most frequently forged issue in the whole history of stamp collecting! Certain it is that 90 per cent. of the specimens of P.S.N.C. issues found to-day in old collections are, in fact, forgeries.

In this connection a curious position arises. Accompanying an article published some 10 years ago in "*Sea Breezes*," the house magazine of the P.S.N.C., an illustration of the 2 reals value appeared, showing an old-time packet boat steaming from right to left of the stamp. In the Stanley Gibbons' Catalogue the same stamp (Peru, type 2) shows the steamer proceeding from left to right!

There are, of course, a number of genuine specimens held in private collections, but the Pacific Steam Navigation Company's own stock was exhausted in a somewhat tragi-farcical manner, as one gentleman, still a member of the Company's staff, recalls in a melancholy way. When he was little more than a newly entered junior, full of enthusiasm for his job, his Chief was interviewed by a gentleman, apparently of some importance, who was interested in these stamps. His Chief turned to him and said: "I think you will find a few stamps in the corner of that bottom drawer." A search was made in the drawer indicated and the enterprising stranger allowed to help himself to the lot!



We take this opportunity of making acknowledgment to Stanley Gibbons Ltd., for their courtesy in loaning the stamps from which the illustrations used with this article and the Stamp Gossip have been prepared.

A Curious Error

A correspondent in *Gibbons Stamp Monthly* draws attention to a curious error in the design of the current 50c. Canadian pictorial illustrated in our issue for June 1929. This stamp shows the Nova Scotian schooner "*Bluenose*" winning the international fishery championship race from an American contender, but the winner's number as shown on the sail is *1*. Actually this was the number of the American vessel, the number carried by "*Bluenose*" being 11.

Costa Rica's Air Mails

A somewhat ridiculous position has arisen in connection with the air mail issues of Costa Rica intended for the franking of letters carried by the Pan-American Airways from Costa Rica to the United States.

When the service was announced the Costa Rican Government surcharged 60,000 stamps of various denominations for air mail use, but long before the first flight was due to take place, the whole issue had been sold out, principally to stamp dealers and collectors. Less than 4,000 letters actually made the flight, and it has been estimated that less than 6,500 of the stamps issued were actually used for postage!

A further issue of 1,000,000 surcharged stamps has now been made, but, as the dealers have large orders in hand, it seems probable that the Costa Rican Government is about to net a further considerable revenue for doing nothing more than set the State stamp printing presses in motion!

Stamp collectors are a curious race! Can one wonder that impecunious countries consider new stamp issues a quite legitimate method of raising the wind!

Stamp Dealers' Trials

The life of a busy stamp dealer is by no means all unrelieved work, if two incidents recently experienced by Messrs. Stanley Gibbons are to be believed.

A dear old lady, always willing to do her bit, entered No. 391, Strand, and asked how she was to carry out the injunction of the latest South African slogan cancellation "Stop the Dongas." She went away perfectly happy when she was told to put salt on their tails!

A recent mail brought Messrs. Gibbons the offer of a chunk of the first Atlantic cable! The principals now expect to be asked to purchase a piece sawn off the old 2LO carrier wave!

Algerian Centenary Issue

To those whose romantic imaginations picture Algeria, France's Colony on the southern Mediterranean shore, as a land of palms and precious little civilisation, the illustration of the beautiful modern railway station at Oran, given on the 5c. value of the recently issued pictorial set commemorating the centenary of French occupation, will give a severe shock.

Although there is still much of the old world about Algeria and Algiers, the designs of this long set, comprising 13 well produced stamps, include several highly interesting views of their life and architecture that display as modern an outlook as any European city.

Stamp Collecting—(*Continued from page 579*)

but in recent years a deep water wharf, 520 ft. in length, has been built to provide berthage for large vessels.

Zanzibar, another 1,100 miles up the coast, is our next stopping place, and from the 10c. value of the 1908/9 issue we gain an excellent impression of the water front before we pass still further north through the Red Sea and the Suez Canal en route to Malta.

Lying almost exactly half way between Port Said and Gibraltar, is Malta, the naval base for the British Mediterranean Fleet, and an important port of call for merchant ships bound to and from the East. The ¼d. value of the 1901 issue and the 1/- value of the current issue provide excellent views of Valletta harbour.

From Malta a comfortable day's steaming will take us across to Tripoli, the chief port of the Italian North African province, Tripolitania, which is shown in our illustration from the Tripolitanian 1927 issue.

On the last stretch of our trip, we cross the Bay of Biscay to La Rochelle, one of the smaller French western ports, a view of which appears on the recently introduced 10 franc design.

And thus to home. There are many places still remaining to be visited, and those of our readers who care to undertake a further cruise alone, at a leisured pace, will discover many interesting facts relating to distant parts of the world, that will help to make their stamp collecting a more fascinating hobby than ever before.

How to obtain the "*M.M.*"

The "*M M.*" may be ordered from all Meccano dealers, or from any newsagent or bookstall, price 6d. per copy. If desired it will be sent direct, post free, for 4/- for six, or 8/- for twelve issues. As a rule back numbers cannot be supplied, because only sufficient cop es are printed to fill standing orders. To prevent disappointment, therefore, place a regular order with your dealer, newsagent, or the publishers—

"Meccano Magazine," Binns Road, Old Swan, Liverpool.

COMPLETE YOUR FILES

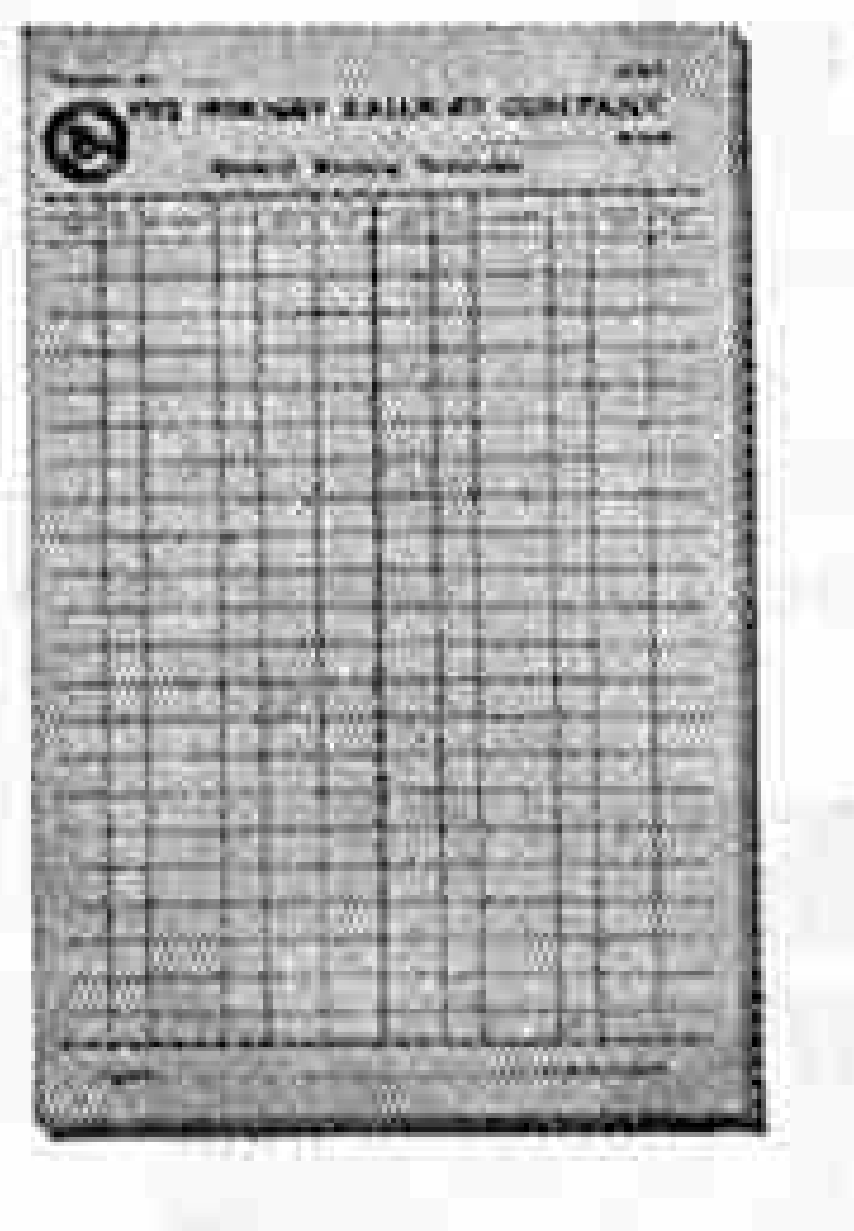
All "Meccano Magazines" prior to December, 1923, are out of print. Each of the 1924 issues, with the exception of January, February and September is in stock. Only the June, July, October and November, 1925, issues are available. All the 1926, 1927, 1928, 1929 and 1930 issues are in stock, with the exception of January, February, April and May, 1926, January, March, July and August, 1927, January and February, 1928.

Copies of back issues will be sent, post free, price 3d. for issues prior to 1925, 4d. for the issues of 1925 and 1926, with the exception of the December numbers. The December issues, 1925 and 1926, and all the issues of 1927, 1928, 1929, and 1930 are 8d. each.

Quotations for complete bound volumes may be obtained from the publishers—

"Meccano Magazine," Binns Road, Old Swan, Liverpool.

Hornby Railway Company Forms



Perfect miniature reproductions of the forms used in actual Railway practice are available to members of the Hornby Railway Company.

Pads of the following, each containing 50 forms, may be obtained from Headquarters, price 5d. each, post free. Each type of pad is supplied in a distinctive tint.

G.W.1. General Working Time-tables.
S.D.4. Stationmaster's Arrivals and Departures.
E.J.5. Engineman's Job Cards.
S.B.6. Signal Box Instructions.
S.R.7. Stationmaster's Report Forms.

The price of the complete set of five pads is 1/9 post free.

IMPORTANT.

Please quote membership number when ordering supplies.

Headquarters: Hornby Railway Company, Old Swan, Liverpool.

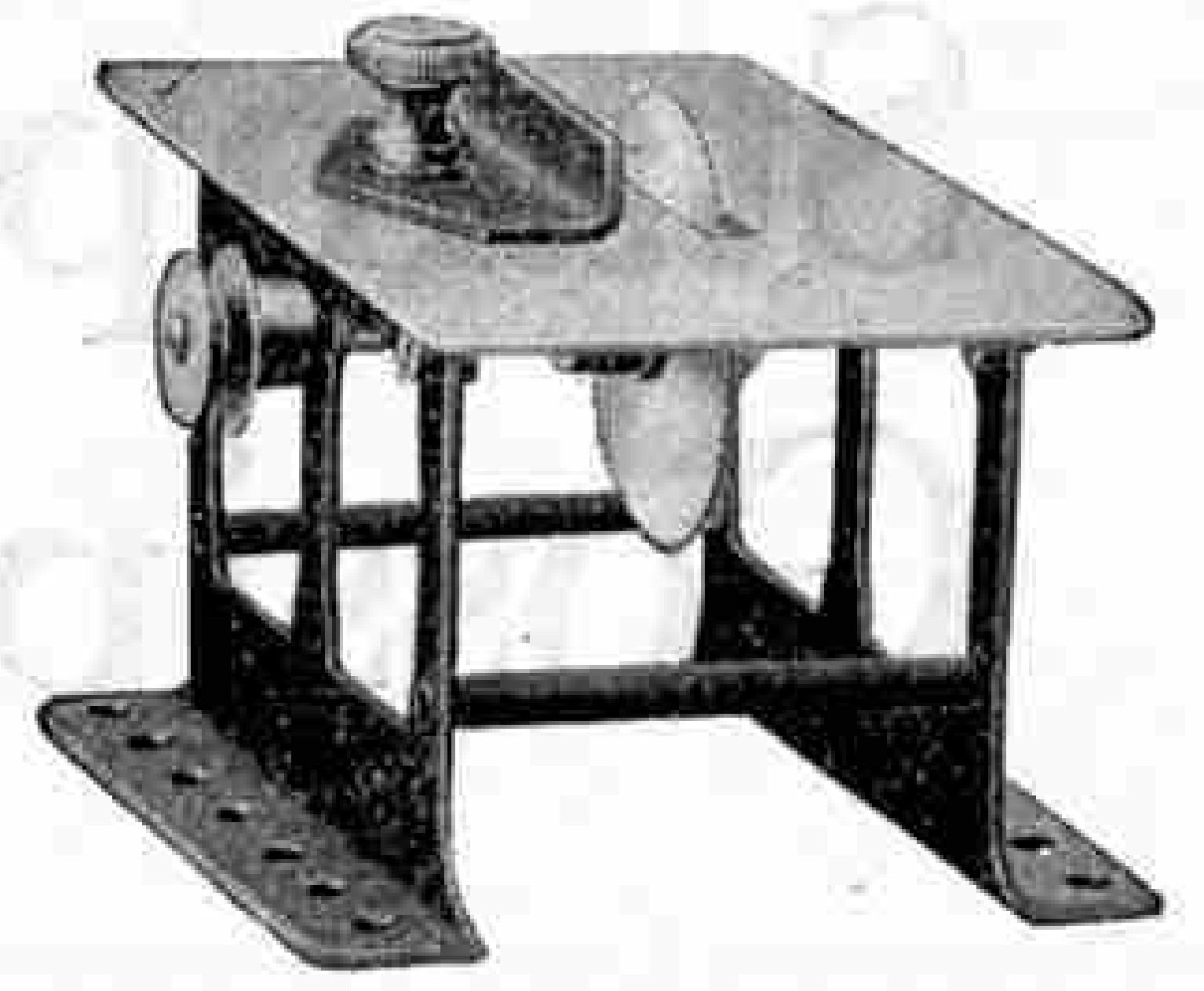
"MECCANO MAGAZINE" SPRING BACK BINDER

There is no better way of keeping your Magazines clean and tidy than by binding them in one of the special binders we supply.

These binders have strong stiff backs, covered with black imitation leather, tastefully tooled, and are lettered in gold. The large binder holds 12 Magazines—price 4/6 post free. The small binder holds 6 Magazines — price 3/- post free.

Meccano Ltd., Old Swan, Liverpool.

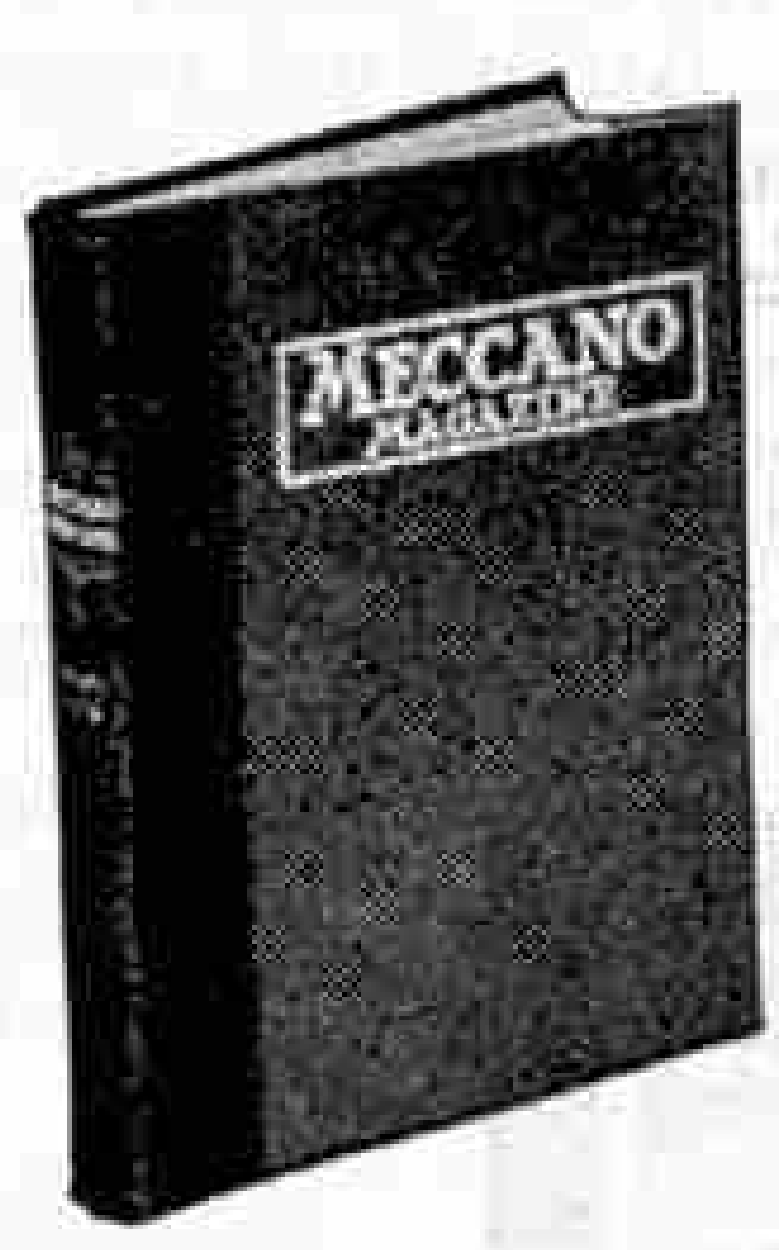
MECCANO SAW BENCH



This model Saw Bench is suitable for use with an Electric or Clockwork Motor or Steam Engine. By means of the equidistant holes in the base it may be built into a Meccano Model Workshop. Beautifully finished in black enamel and nickel. Price 4/-.

Meccano Ltd., Binns Road, Old Swan, Liverpool.

BINDING THE "*M.M.*"



Binding cases for back numbers of the Magazine may be obtained from Messrs. O. H. Bateman and Co., 23, Hanover Street, Liverpool. These are supplied in two sizes (1) for six copies price 3/6 and (2) for twelve copies price 5/3, post free in each case. The binding cases are supplied in what is known as "Quarter Basil, full cloth"—that is to say three-quarters of the sides are dark crimson cloth and the back and a quarter of the sides are dark crimson leather as shown here. The case is tastefully embossed in gold with the name "Meccano Magazine," and on the back is the name and volume number.

Binding 6 or 12 copies. These binding cases are supplied so that readers may have their Magazines bound locally, but where desired, the firm mentioned above will bind Meccano Magazines at a charge of 6/6 for six issues or 8/6 for twelve issues, including the cost of the binding and also return carriage. The covers of the Magazines may be included or omitted as required, but in the absence of any instructions to the contrary they will be included.

Whilst the binding of the twelve Magazines is quite satisfactory, they form a rather bulky volume and for that reason arrangements have been made to bind six months' Magazines where so desired, as explained above. Back numbers for any volume can be bound and the case will be embossed with the volume number.

WRITING PADS
FOR MECCANO BOYS

These Writing Pads are becoming increasingly popular and most of the letters we receive from Meccano boys are written on the familiar tinted paper. The pads are supplied in two sizes, each consisting of 50 sheets of tinted bank paper, with cover. They are just the thing to use when writing to your friends, for the special notepaper shows that you are a Meccano boy.

Prices—Large, 1/- each (post free); Small, 6d. each (post free).

Meccano Ltd., Binns Road, Old Swan, Liverpool.

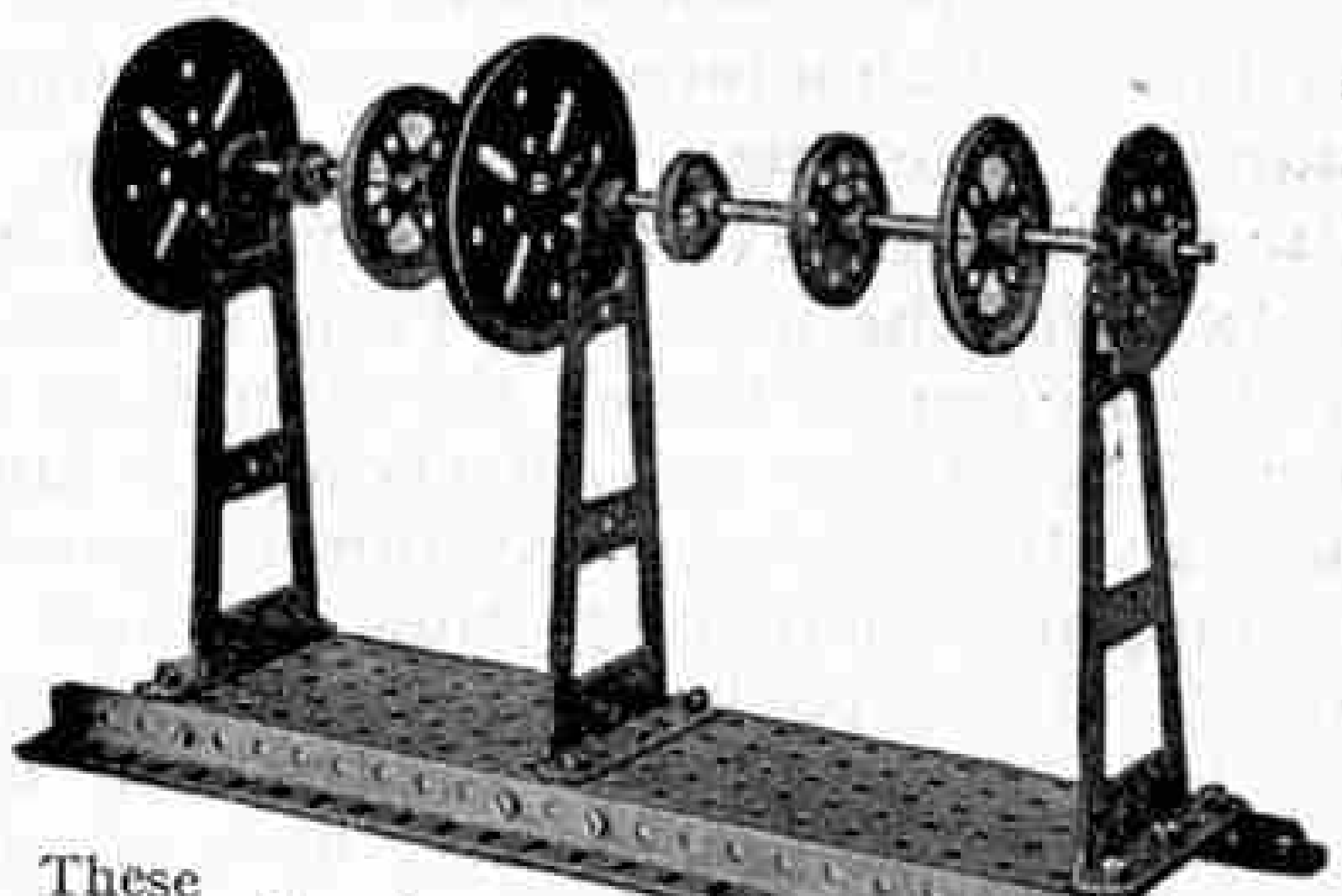
MECCANO ENAMEL

Meccano enamel has been introduced to enable model-builders to convert nickel parts to colour or to touch up coloured parts should such treatment become necessary through mishandling. It is available in red, grey or green, each colour being identical in shade with the enamels used in the Meccano Factory for spraying Meccano parts.

Price per tin 8d.

Meccano Ltd., Binns Road, Old Swan, Liverpool.

MECCANO SHAFTING STANDARDS



These Shafting Standards are designed on the Meccano system, with equidistant holes. Our illustration shows how strong and serviceable shafting may be constructed from Meccano parts with the aid of the Large Standard.

Standard only, Large... ... ... Price 1/-
" " Small ... ... " 8d.

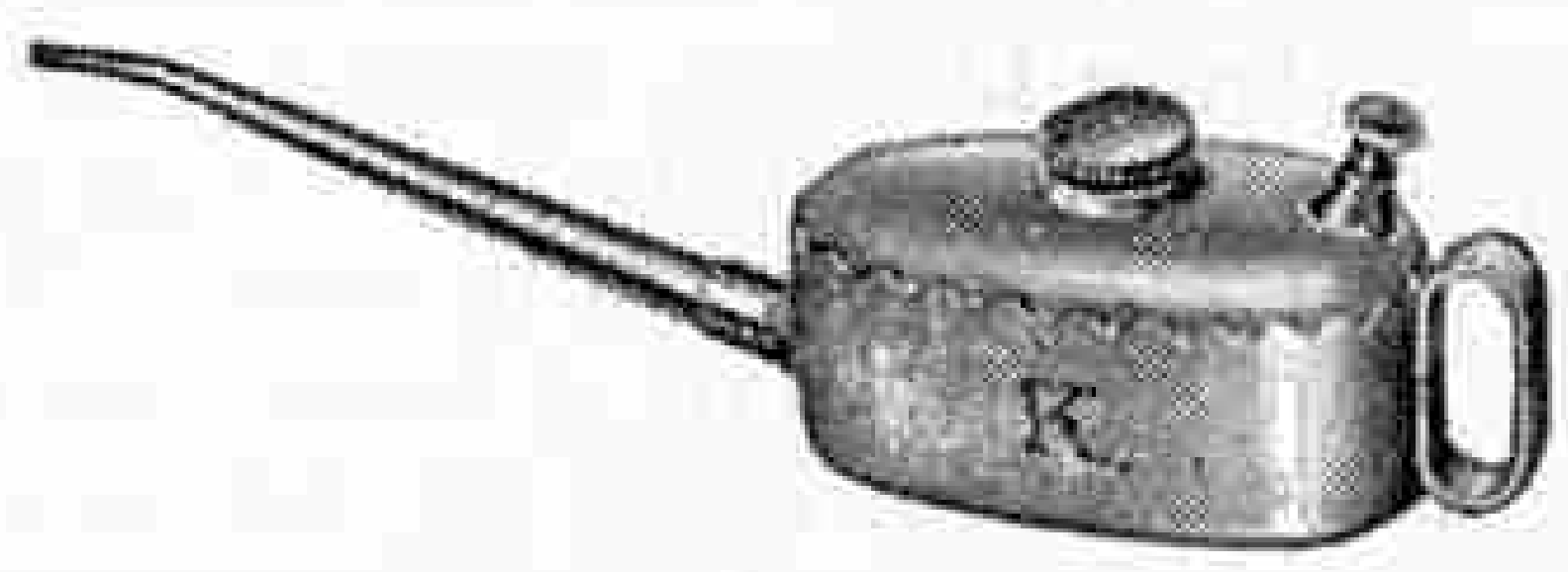
Meccano Ltd., Binns Road, Old Swan, Liverpool.

OIL CAN No. 1 (Ordinary Type)

This miniature Oil Can will give every satisfaction. It may be used for general purposes but it is particularly suitable for oiling Meccano Models and Hornby Trains. Price 6d.

Meccano Ltd., Binns Road, Old Swan, Liverpool.

OIL CAN No. 2 ("K" Type)



Every Meccano and Hornby Train enthusiast should add a miniature "K" type oil can to his equipment for the purpose of oiling Meccano models, Hornby Trains, etc. The oil is ejected drop by drop by depressing the valve, as in the full-sized model, and in all other respects the oiler is perfect.

One of the oil cans was sent to H.R.H. the Prince of Wales, and a gracious letter of acknowledgment was received expressing H.R.H.'s admiration of the beautiful lines and perfect finish of this model. Price 3/6.

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MECCANO LUBRICATING OIL

Before commencing to operate a Meccano model, or to run a Hornby Train, all gears and bearings should be oiled thoroughly with Meccano Lubricating Oil. This oil is specially prepared and is of the right consistency for the purpose. Price per bottle 6d.

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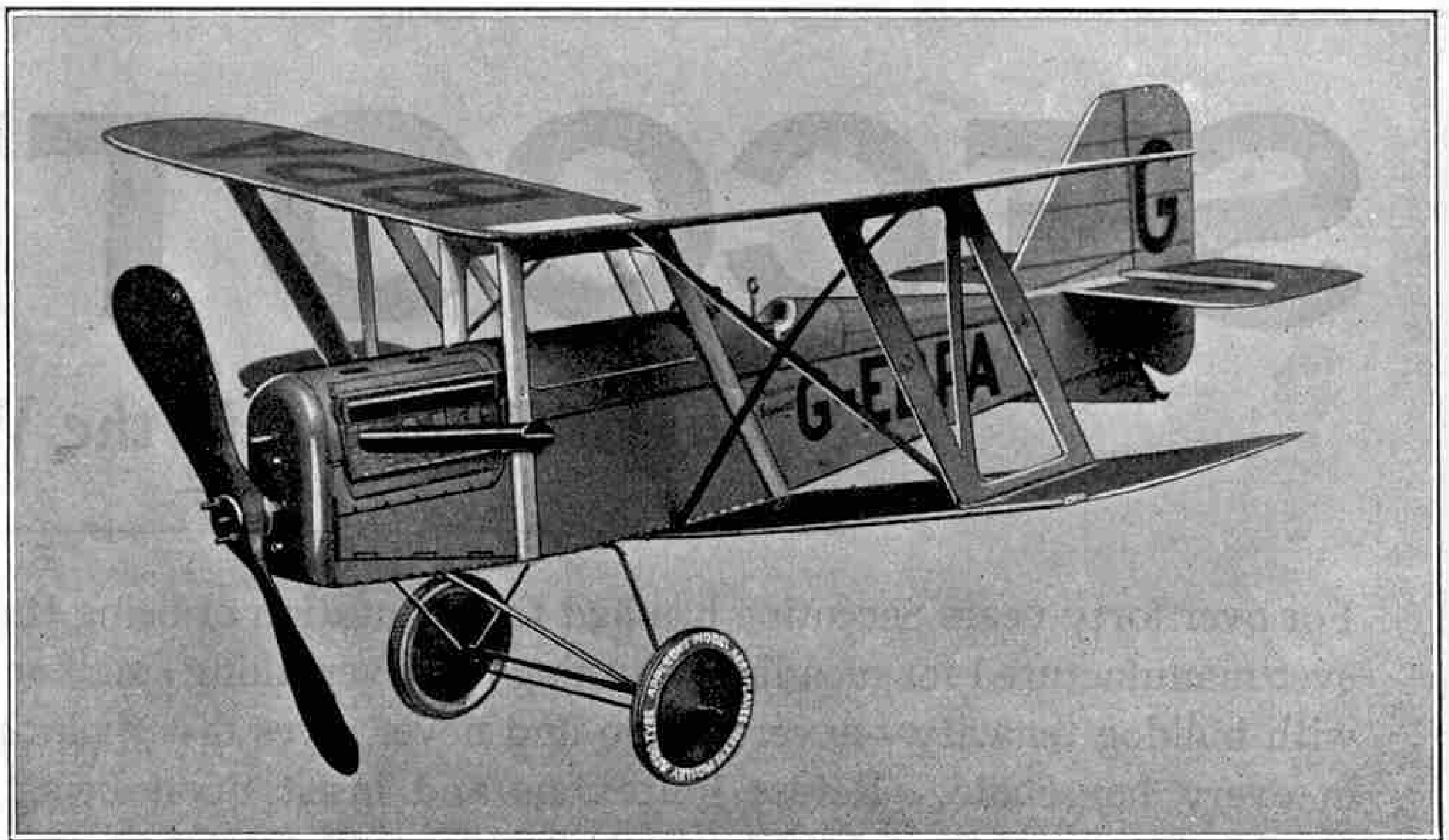
Another Fine Model Aeroplane Construction Set.

The S.E. 5A Single Seater Model Biplane.

We apologise to all our customers who could not get this new Model Aeroplane owing to the overwhelming demand. All our Agents and most Toy Shops and Sports Depots now have stocks for immediate sale.



Actual Photograph of Finished Model

This Model is the last word in Model Aeroplane design and construction. It will rise off the ground in a most realistic manner under its own power.

The Propeller and Motor have been re-designed to give the utmost efficiency and a small Working Joy Stick is fitted in the Cockpit to make the take off fool-proof. The Propeller is fitted with correct pattern Boss and Locking Plates just like a real Aeroplane. This has never yet been incorporated in any Model Aeroplane at such a price.

The Chassis is metal throughout and fitted with real Elastic Shock Absorbers, which allow the wheels to take the shock off a heavy landing.

Complete Set of Parts

PRICE

3/-

Postage and Packing 6d.
Abroad 1/10 extra.

The Aluminium Disc Wheels are fitted with miniature "Moseley" Aeroplane Tyres. There are a lot of other new ideas incorporated in the Model. The length of the model is 14½ inches.

All you have to do is to erect the parts from the profusely illustrated 16 page book of Instructions and Working Drawings.

Obtainable at all our Agents and at most Toy Shops and Sports Depots and at Gamage Ltd., Hamleys Ltd., and at all Messrs. Hobbies Ltd. Branches. If you have any difficulty, send your order direct to us enclosing Postal Order to the value of 3/6 and you will receive your set per return.

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HORNBY SERIES

Gauge 0, 1¼"

Alternate Pegs

Hornby Rails, Points and Crossings are designed to meet the most exacting requirements of model railway enthusiasts. They make possible an almost endless number of realistic and railway-like layouts. Only the finest materials are used in their manufacture.

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CURVED RAILS
9 in. radius

M9	Curved rails (for M0 Trains) ...	per doz.	3/-
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1 ft. radius

A1	Curved rails	per doz.	4/6
A1½	Curved half rails	„	3/6
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AB1	Curved brake rails	each	6d.

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CR1	Right-angle crossings (1 ft.) ...	each	2/-
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COR2	Crossover Points, right-hand	per pair	12/-
COL2	Crossover Points, left-hand		

POINTS
For 9 in. radius curves

MR9	Right-hand points (for M0 Trains)	per pair	3/-
ML9	Left-hand points (for M0 Trains)		

For 1 ft. radius curves

PR1	Right-hand points	... per pair	4/-
PL1	Left-hand points		

For 2 ft. radius curves

PR2	Right-hand points	... per pair	4/-
PL2	Left-hand points		
PSR2	Points on solid base	... per pair	8/6
PSL2	Points on solid base		

STRAIGHT RAILS

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STRAIGHT RAILS (continued)

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B¼	Straight quarter rails	„	2/6
BB1	Straight brake rails	each	5d.
BBR1	Straight brake and reverse rails	„	1/6
DS1	Straight rails, double track ...	½ doz.	6/6
RCP	Rail connecting plates	„	4d.

DOUBLE SYMMETRICAL POINTS
For 1 ft. radius curves

DSR1	Double symmetrical points, right	per pair	5/-
DSL1	Double symmetrical points, left		

For 2 ft. radius curves

DSR2	Double symmetrical points, right	per pair	5/-
DSL2	Double symmetrical points, left		

PARALLEL POINTS

PPR2	Parallel points, right	... per pair	5/-
PPL2	Parallel points, left		

RAILS FOR ELECTRIC TRAINS

STRAIGHT RAILS

EB1	Straight rails	per doz.	6/-
EB½	Straight half rails	„	4/6
EB¼	Straight quarter rails	„	4/-
EDS1	Straight rails, double track	½ doz.	8/6

CURVED RAILS—1 ft. radius

EA1	Curved rails	per doz.	6/6
EA1½	Curved half rails	„	4/6
EA1¼	Curved quarter rails	„	4/-

CURVED RAILS—2 ft. radius

EA2	Curved rails	per doz.	6/6
EA2½	Curved half rails	„	4/6
EA2¼	Curved quarter rails	„	4/-
EDC2	Curved rails, double track ...	½ doz.	9/-

CROSSINGS

ECA	Acute-angle crossings	each	4/-
ECR	Right-angle crossings	„	4/-
TCPL	Terminal connecting plates (low voltage)	„	1/6

POINTS

For 2 ft. radius curves

EPR2	Right-hand points	... per pair	7/6
EPL2	Left-hand points		
EPPR2	Parallel points, right	... per pair	8/6
EPPL2	Parallel points, left		
EDSR2	Double symmetrical points, right	per pair	8/6
EDSL2	Double symmetrical points, left		

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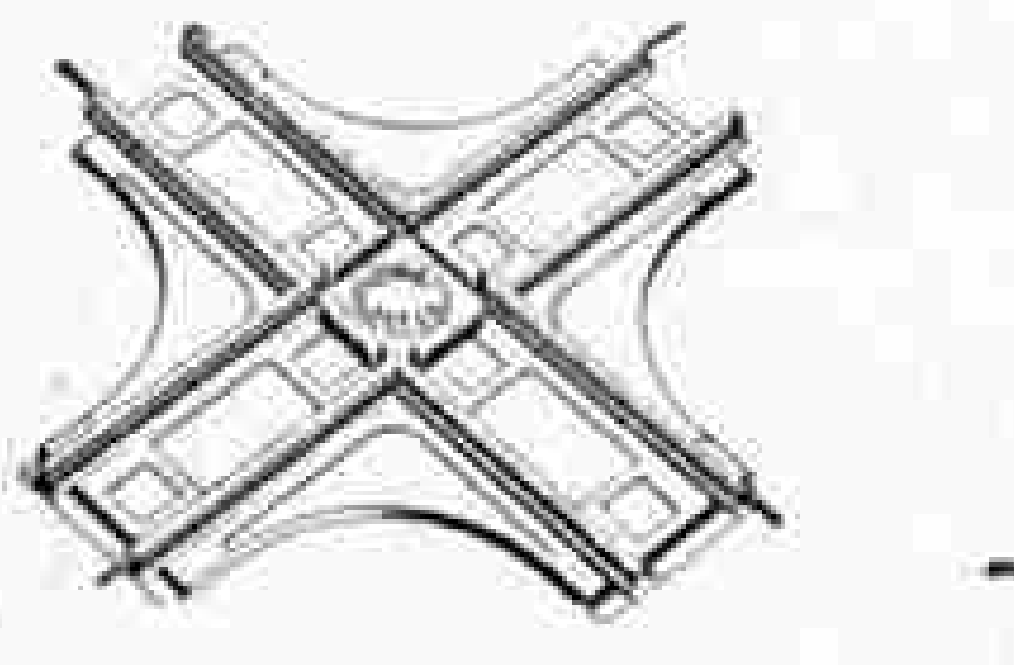
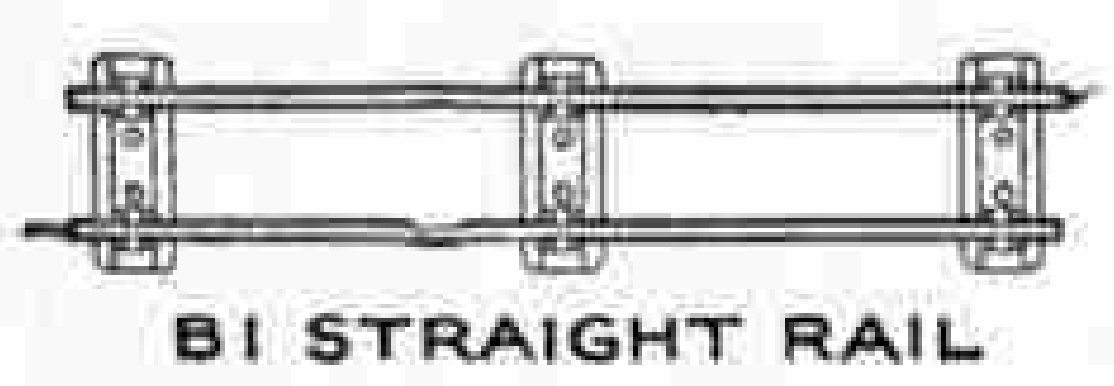
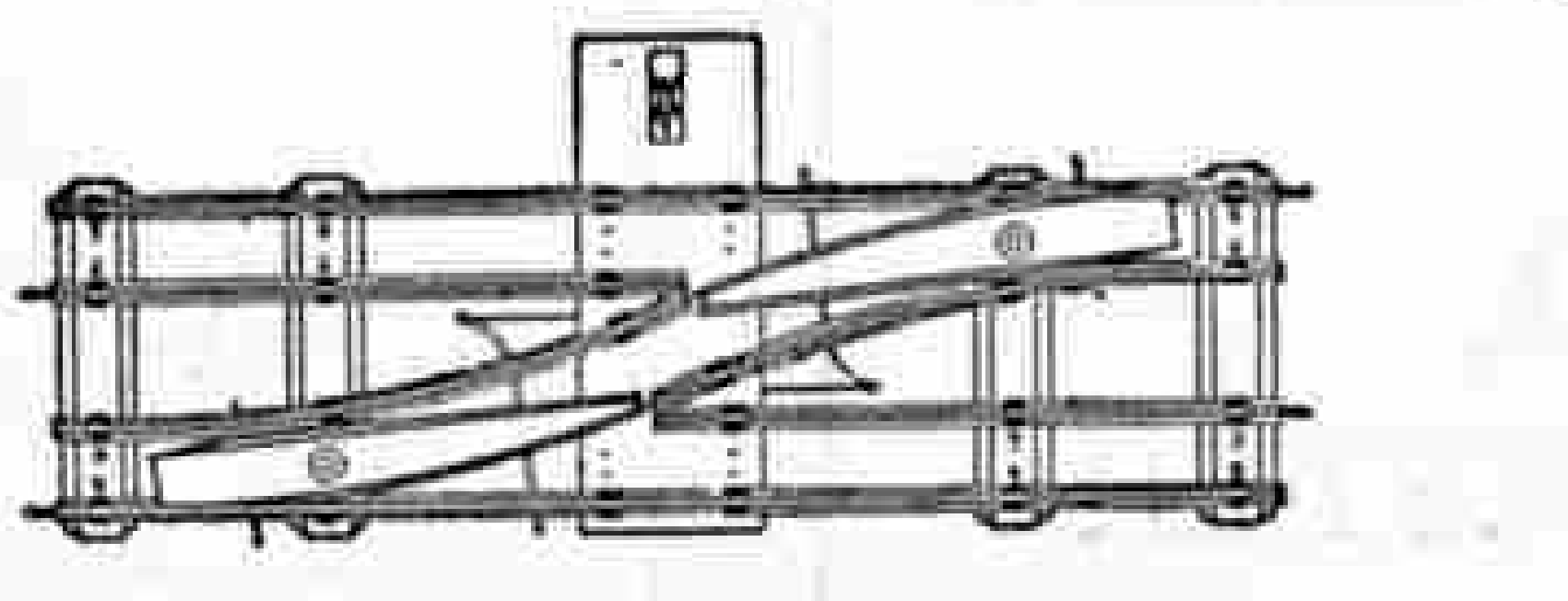


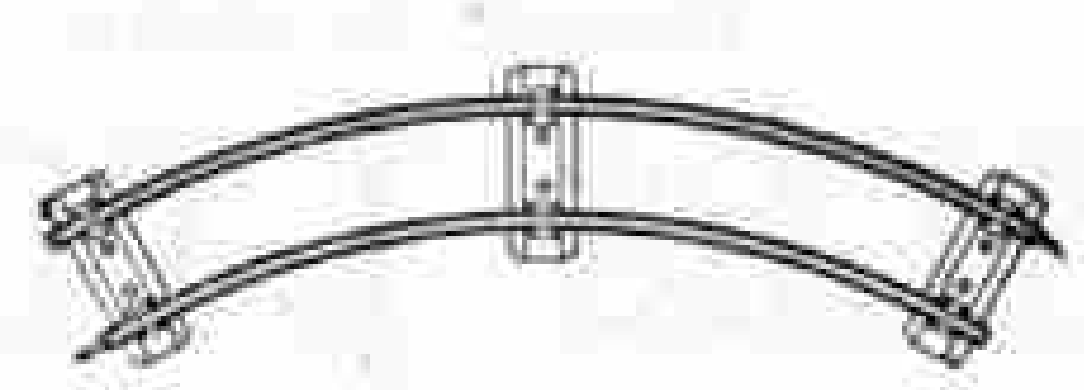
CR2 RIGHT-ANGLE CROSSING



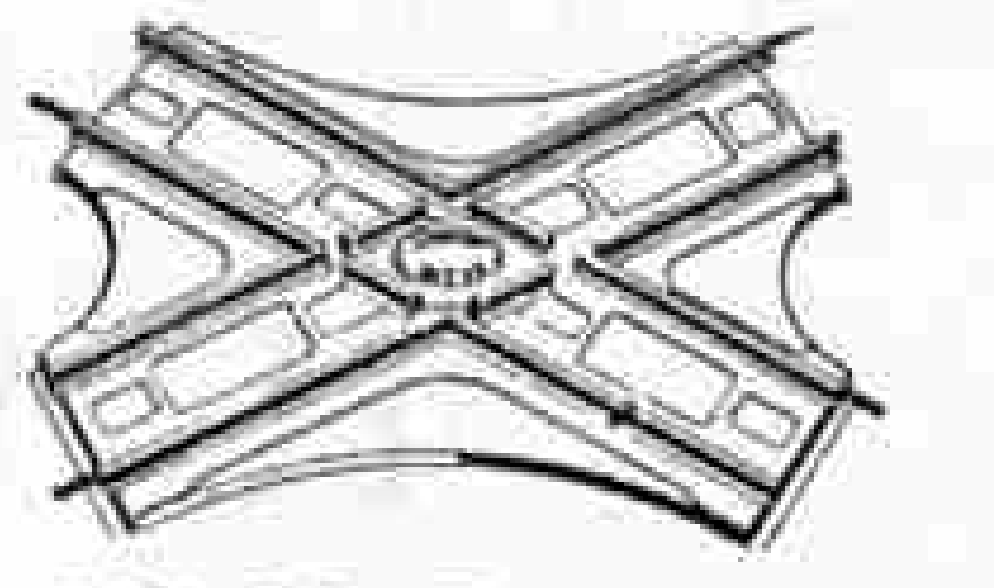
B1 STRAIGHT RAIL



OOL2 CROSSOVER POINTS



A1 CURVED RAIL



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ROCKET BOAT

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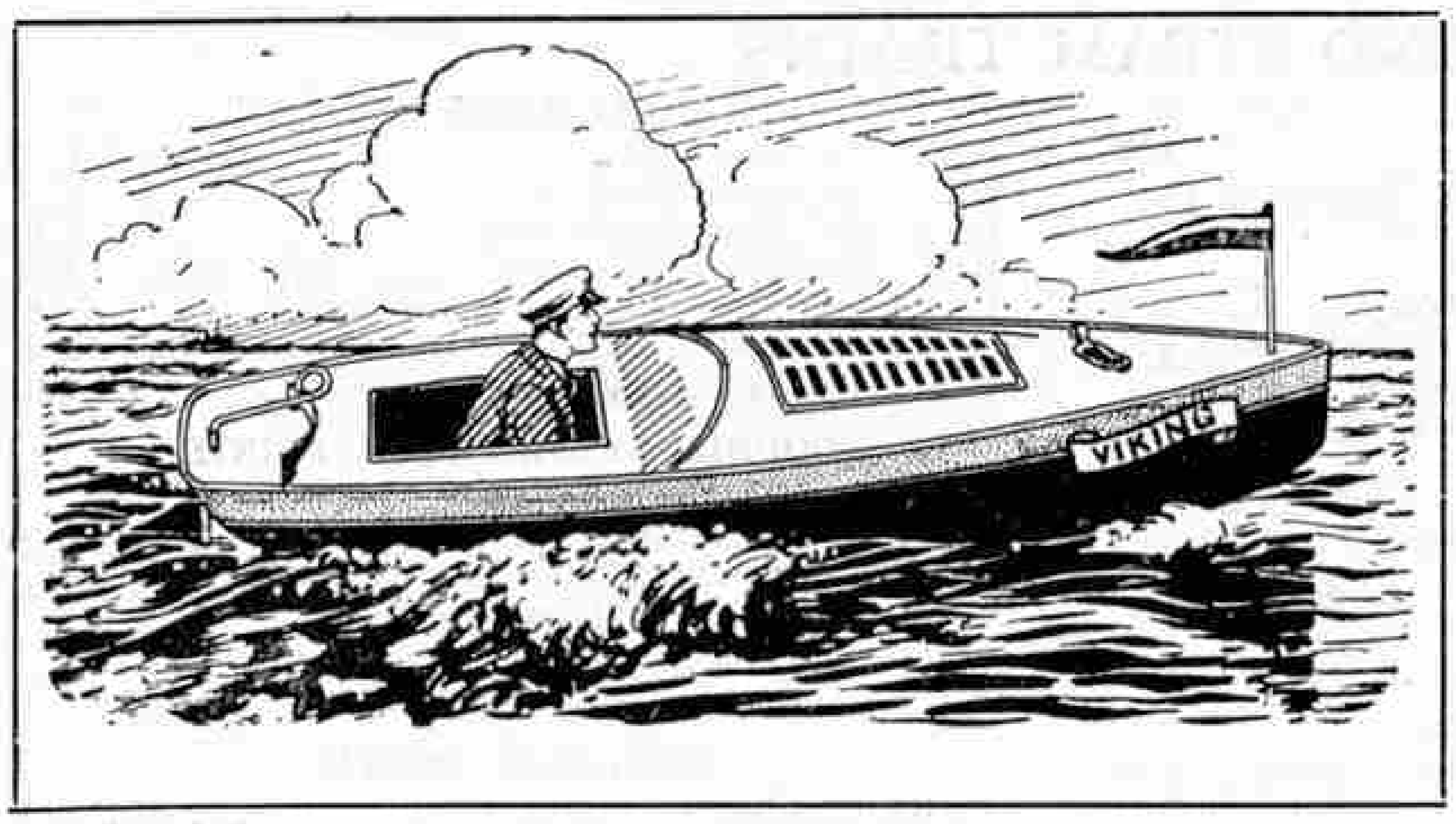

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With Rudder, Tiller, Bollards and Flag.
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It sounds just like a real motor boat.
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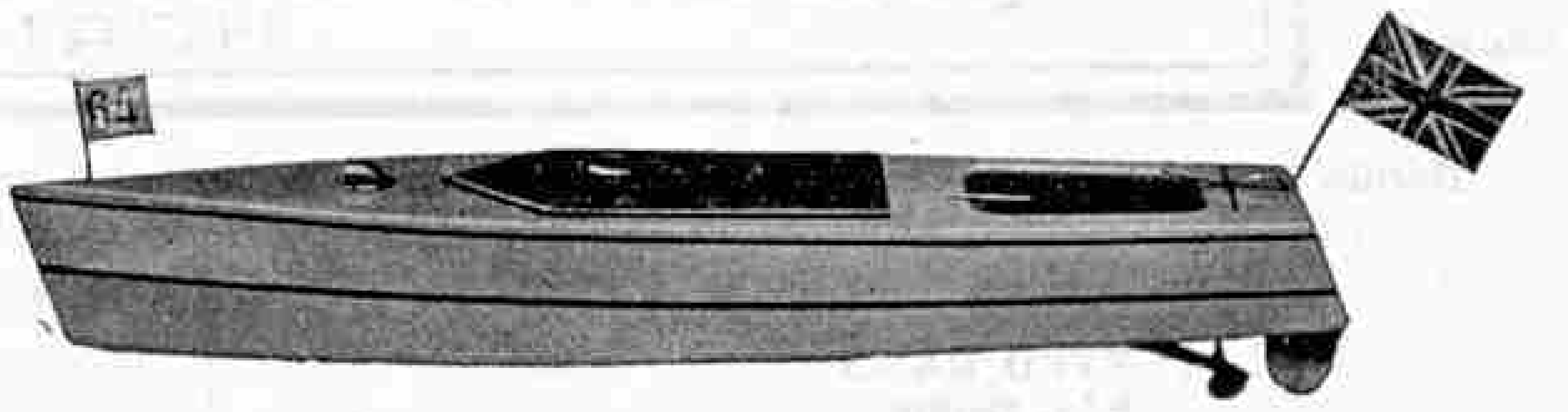
NEW DESIGN MOTOR RACING BOATS



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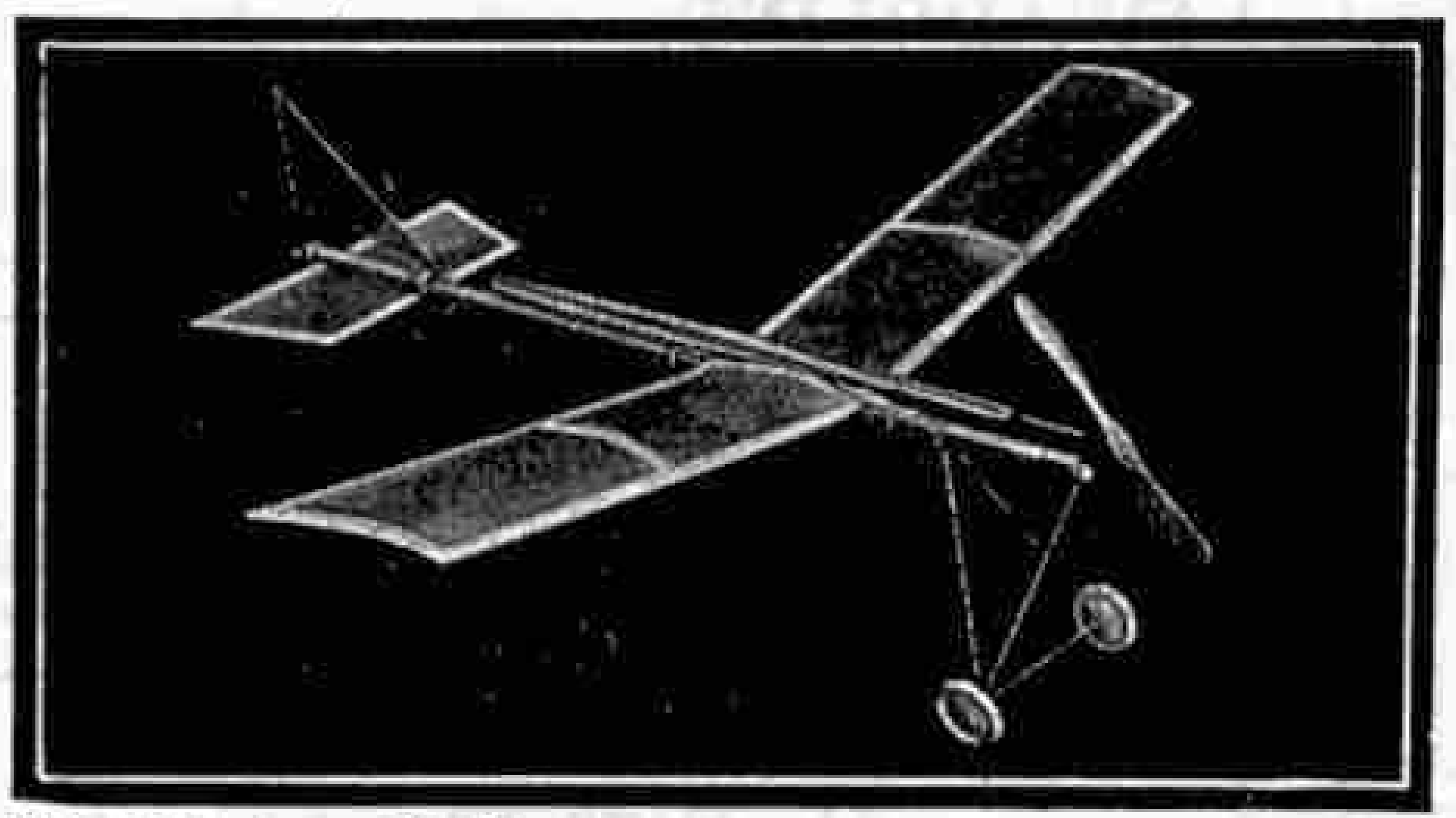

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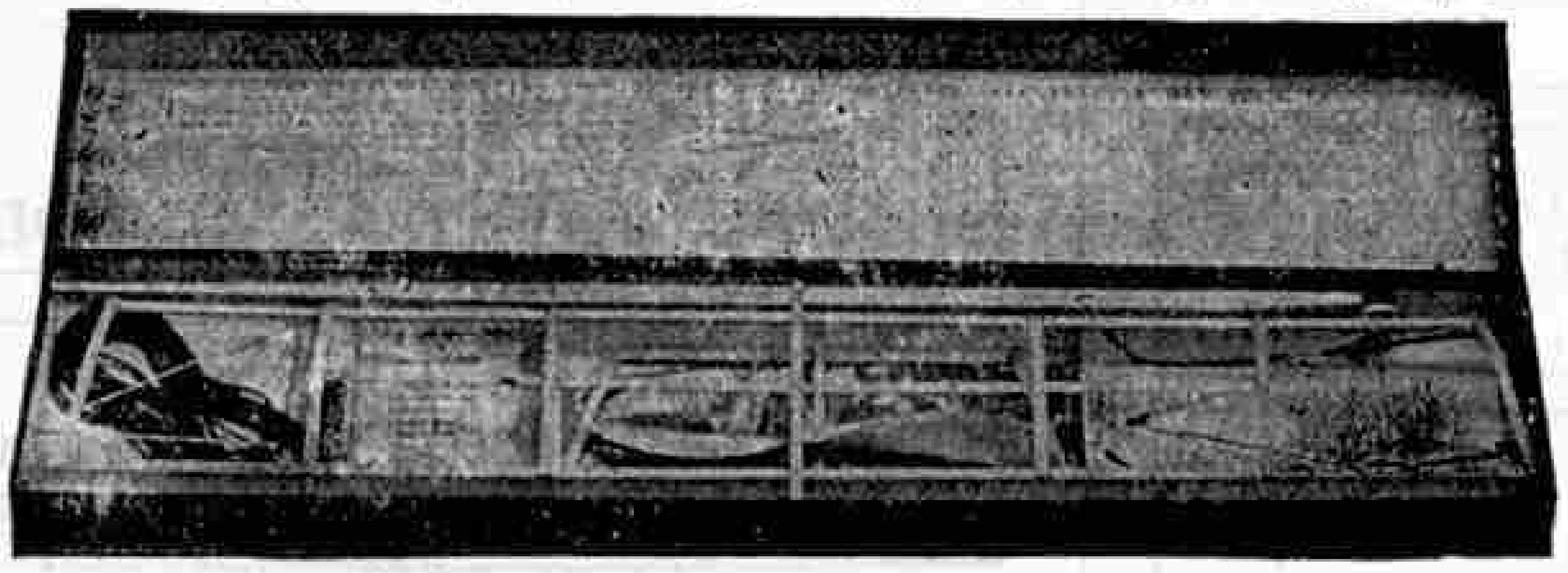

The 1930 "SKISAIL" Tractor Monoplane

CONSTRUCTIONAL SET

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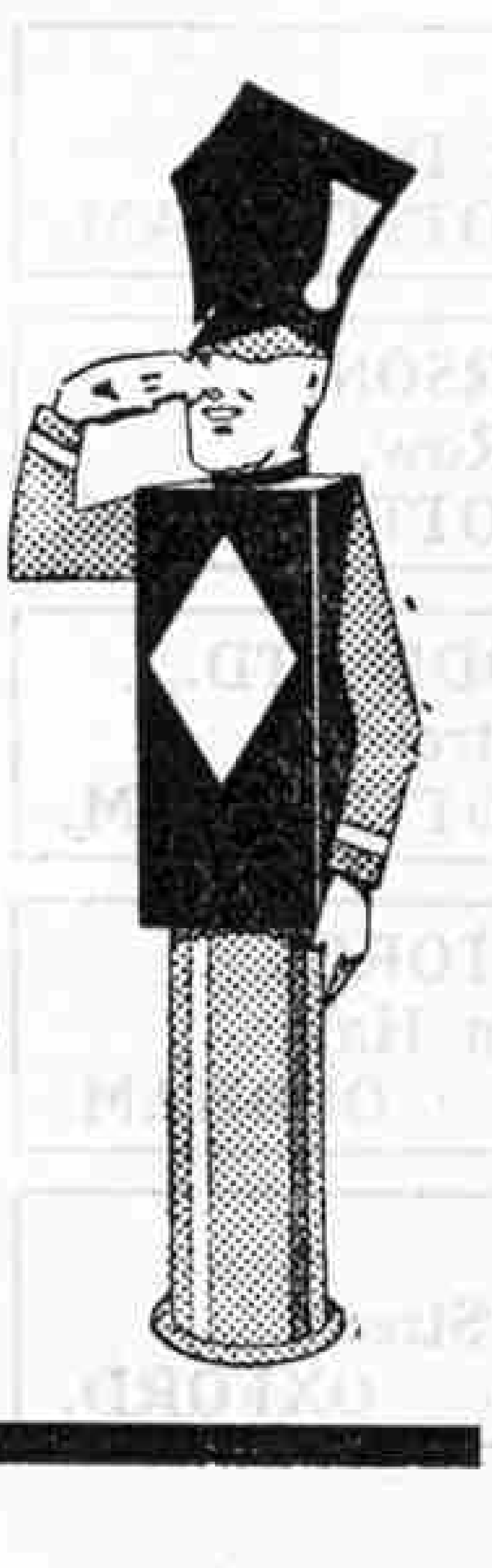

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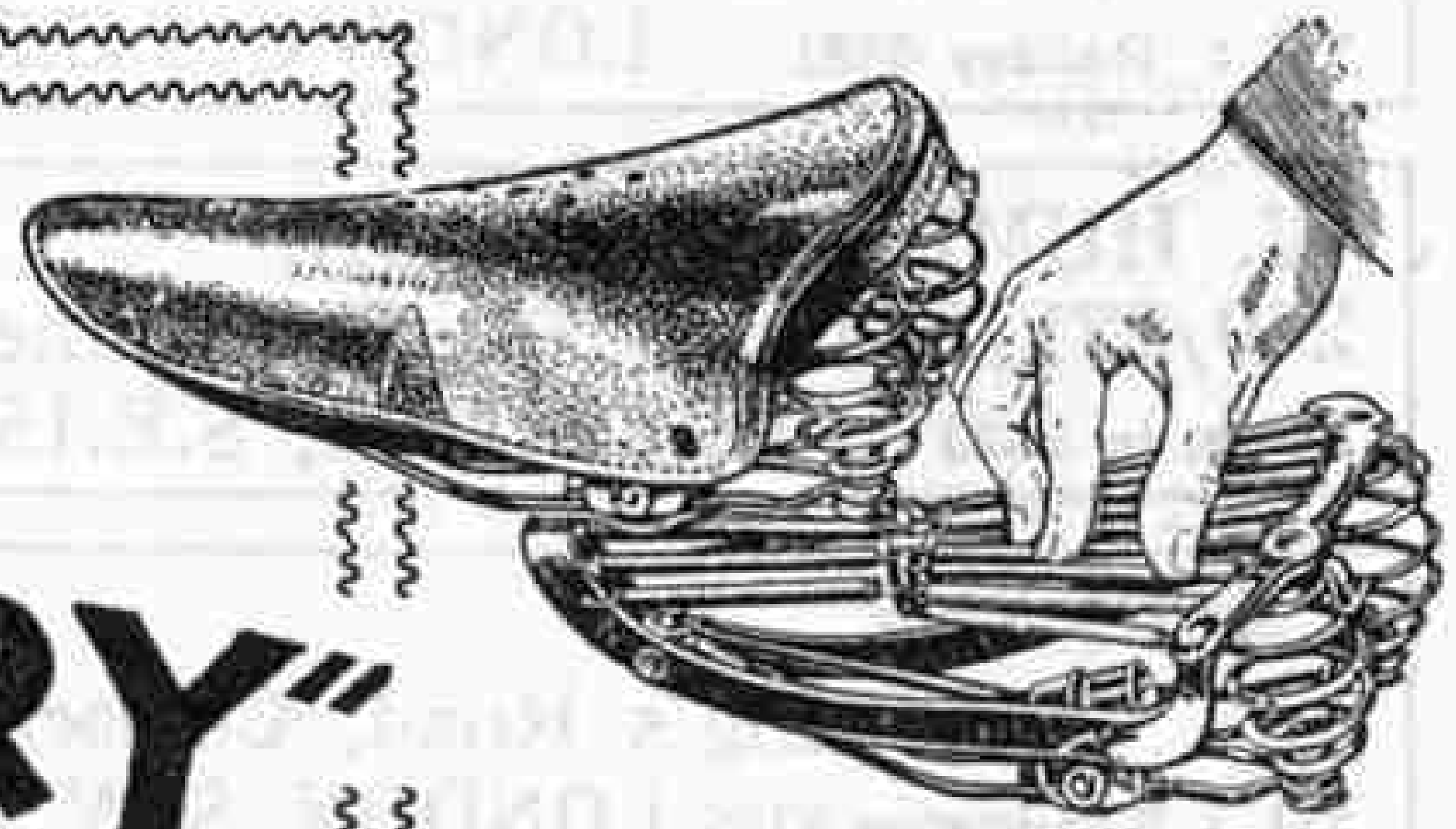

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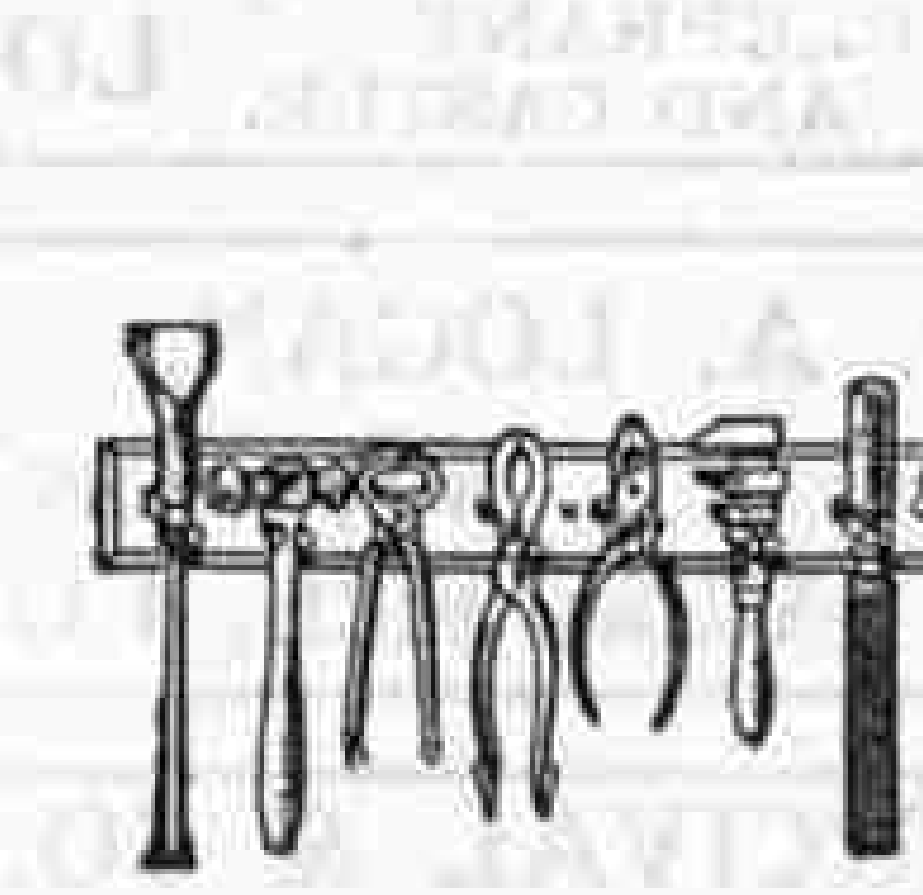

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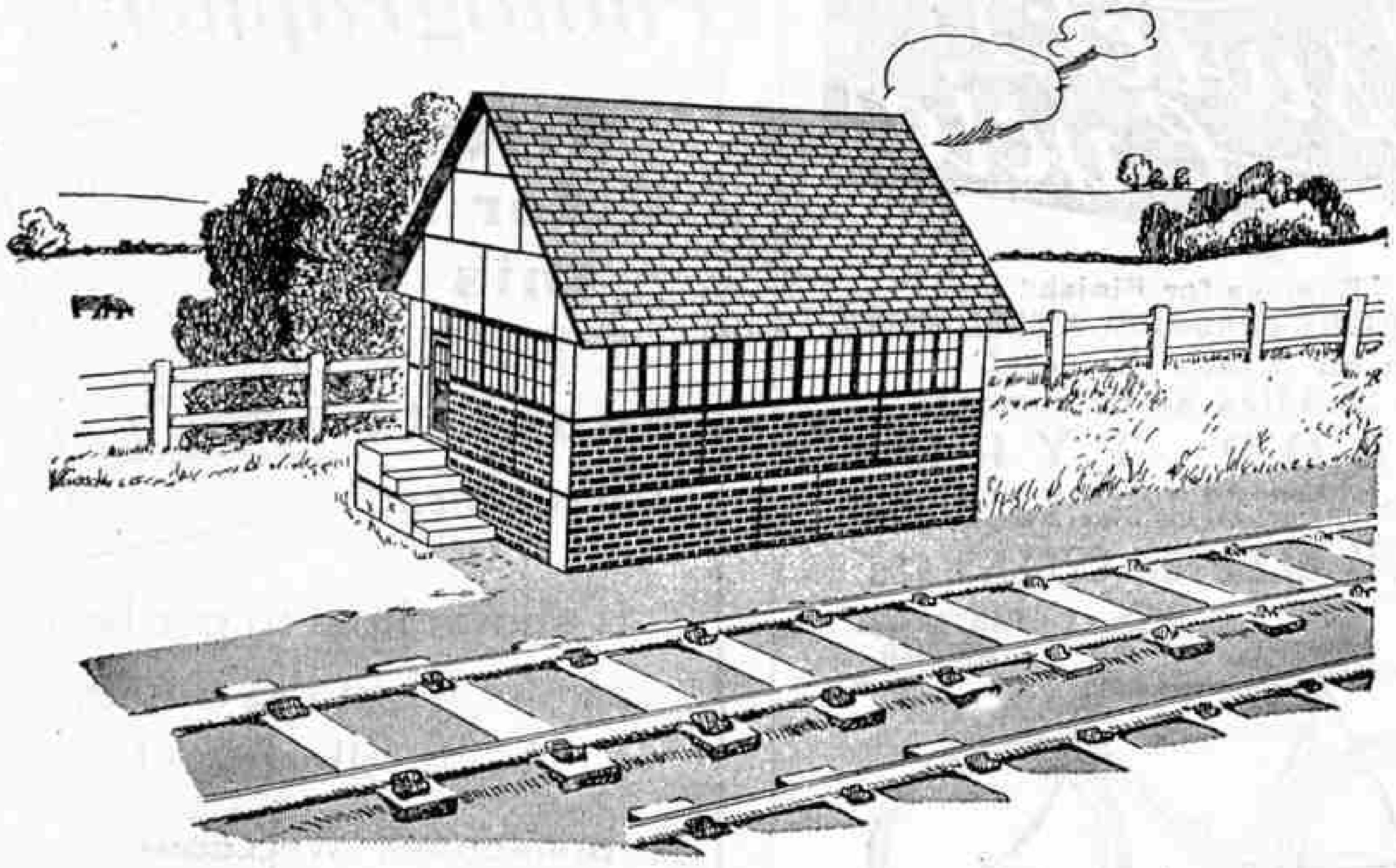

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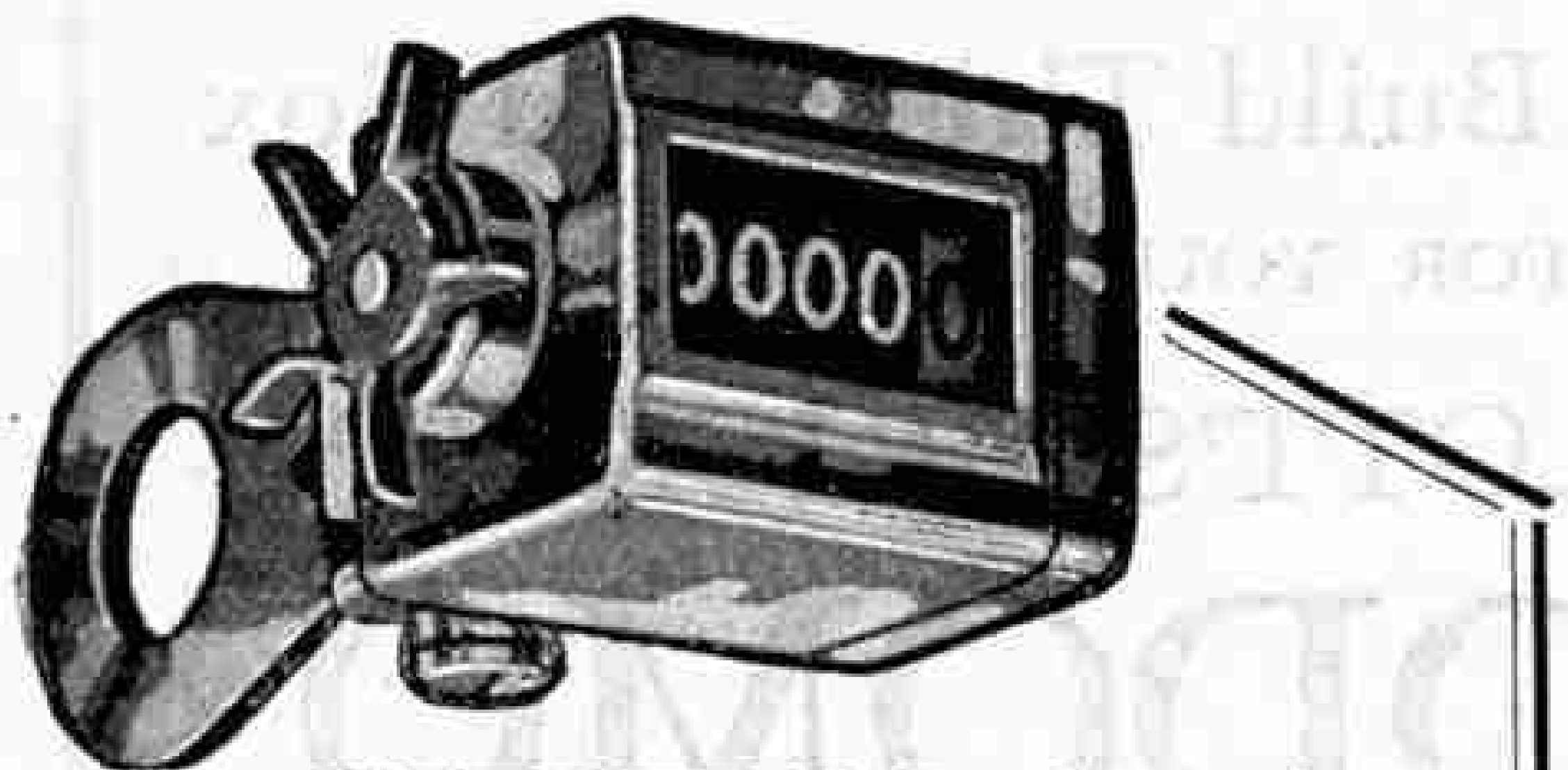

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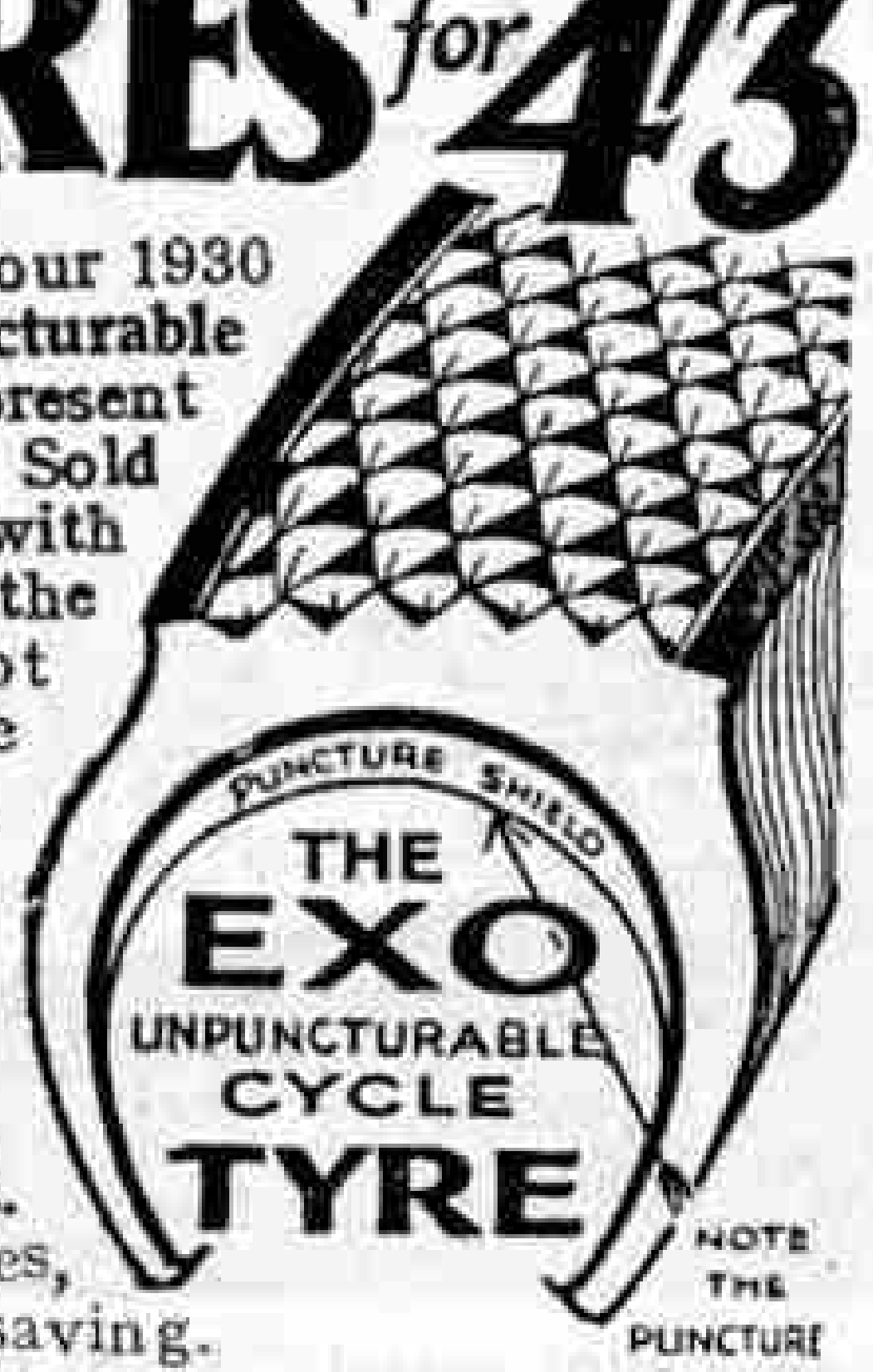

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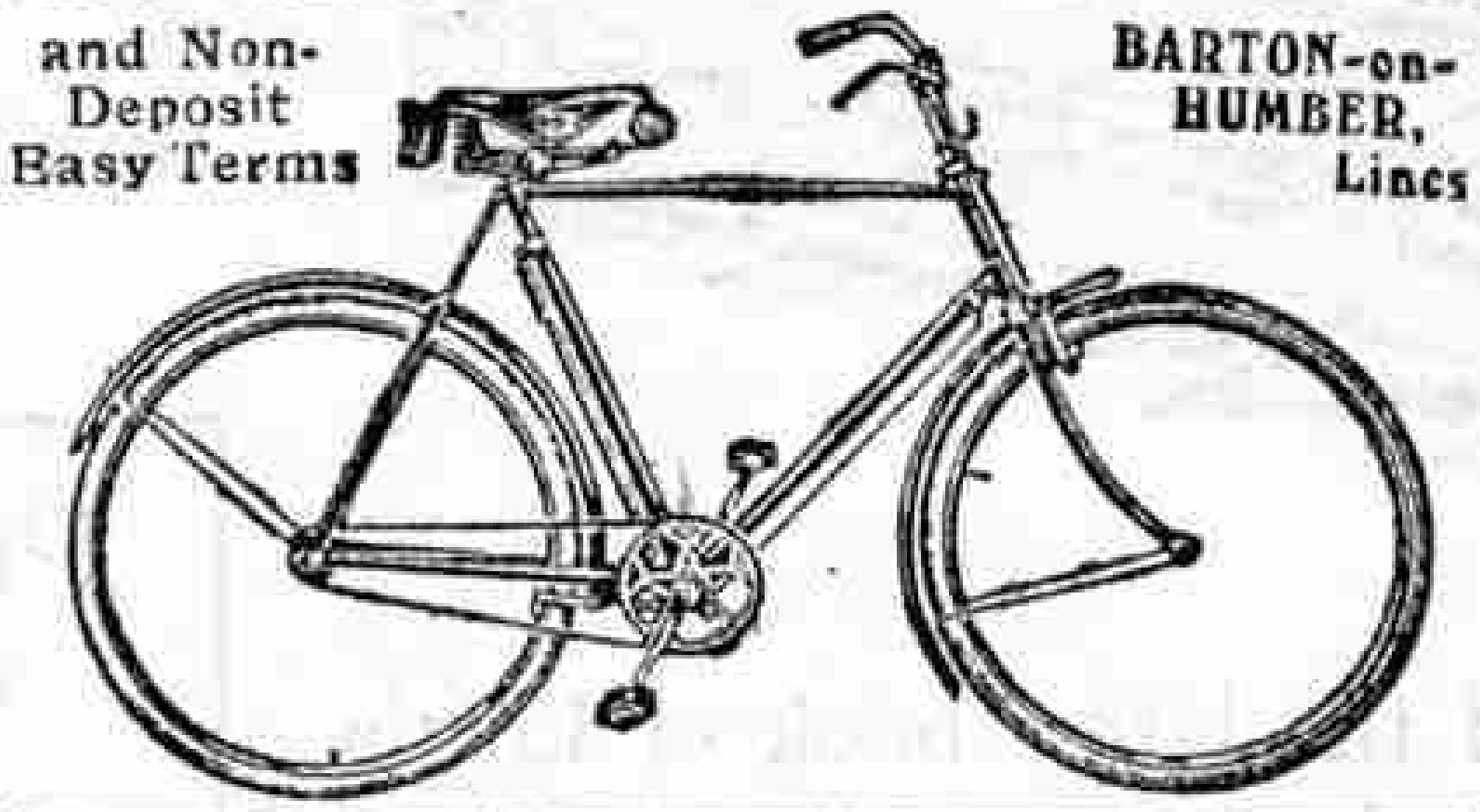

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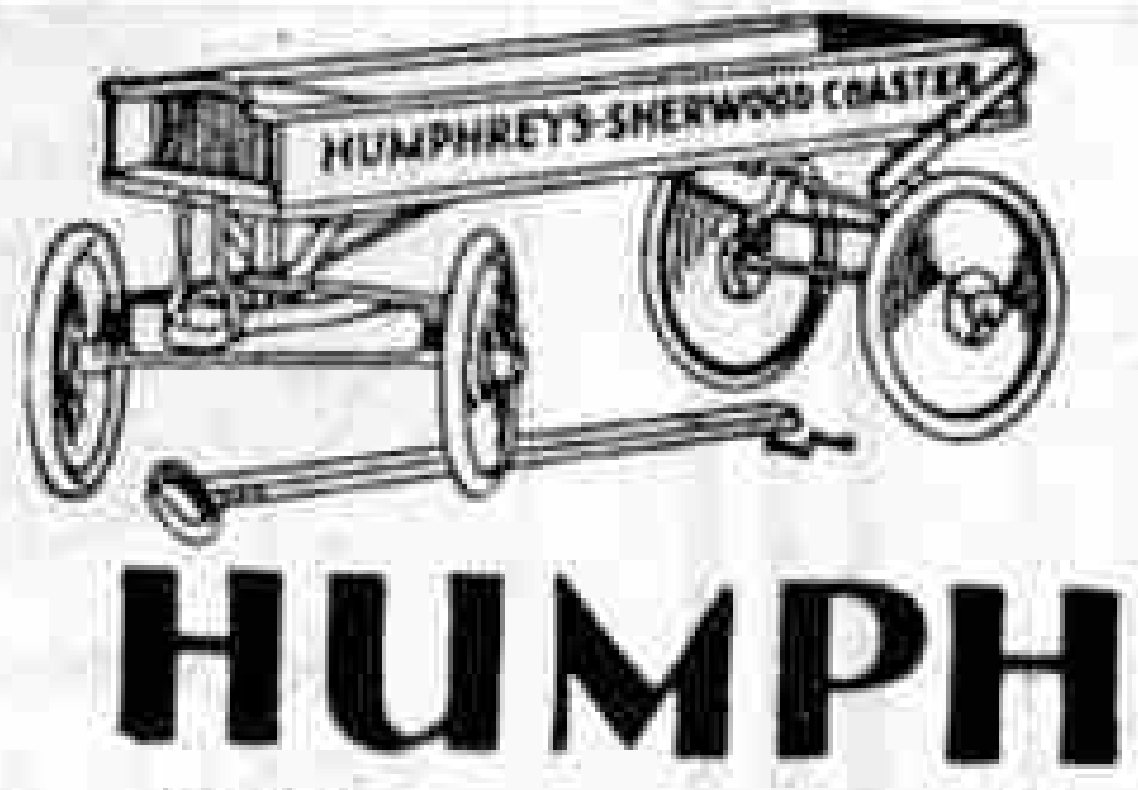

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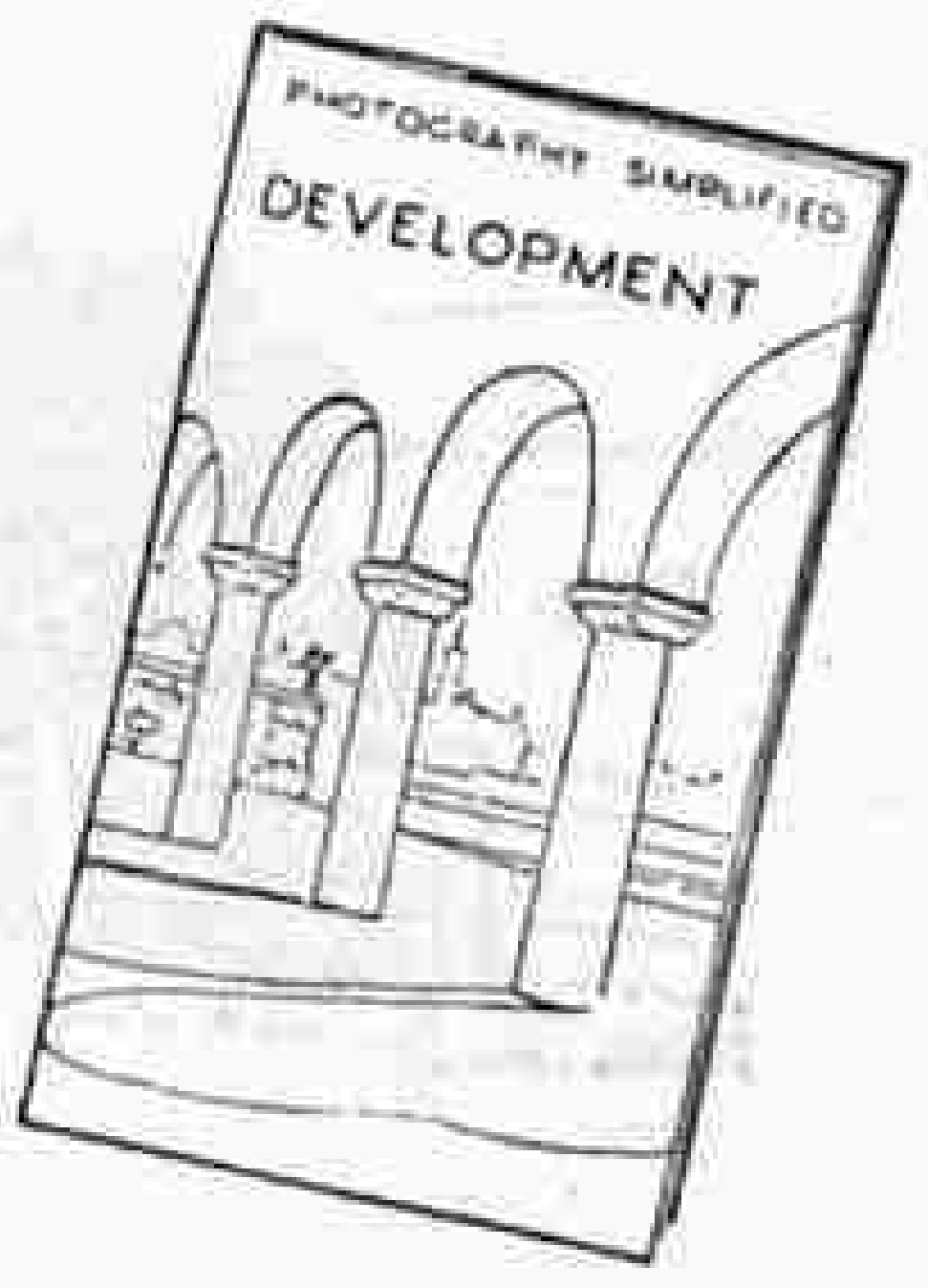

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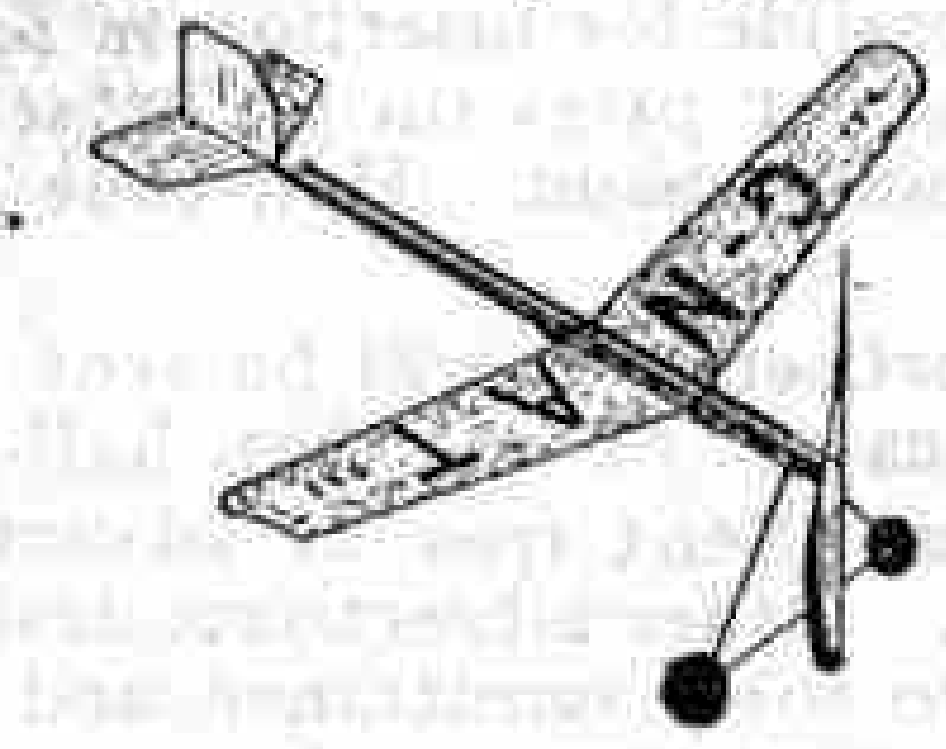

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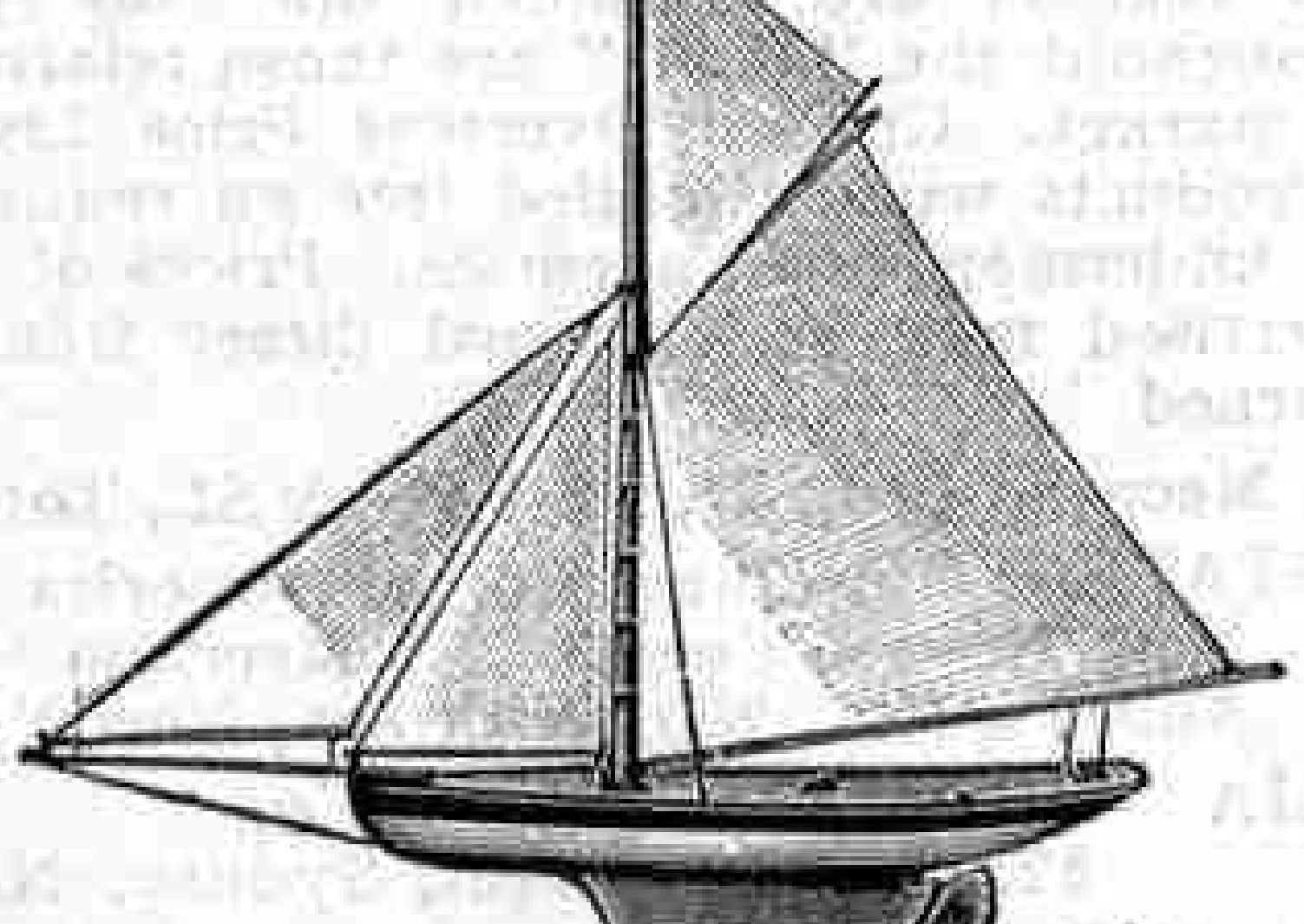

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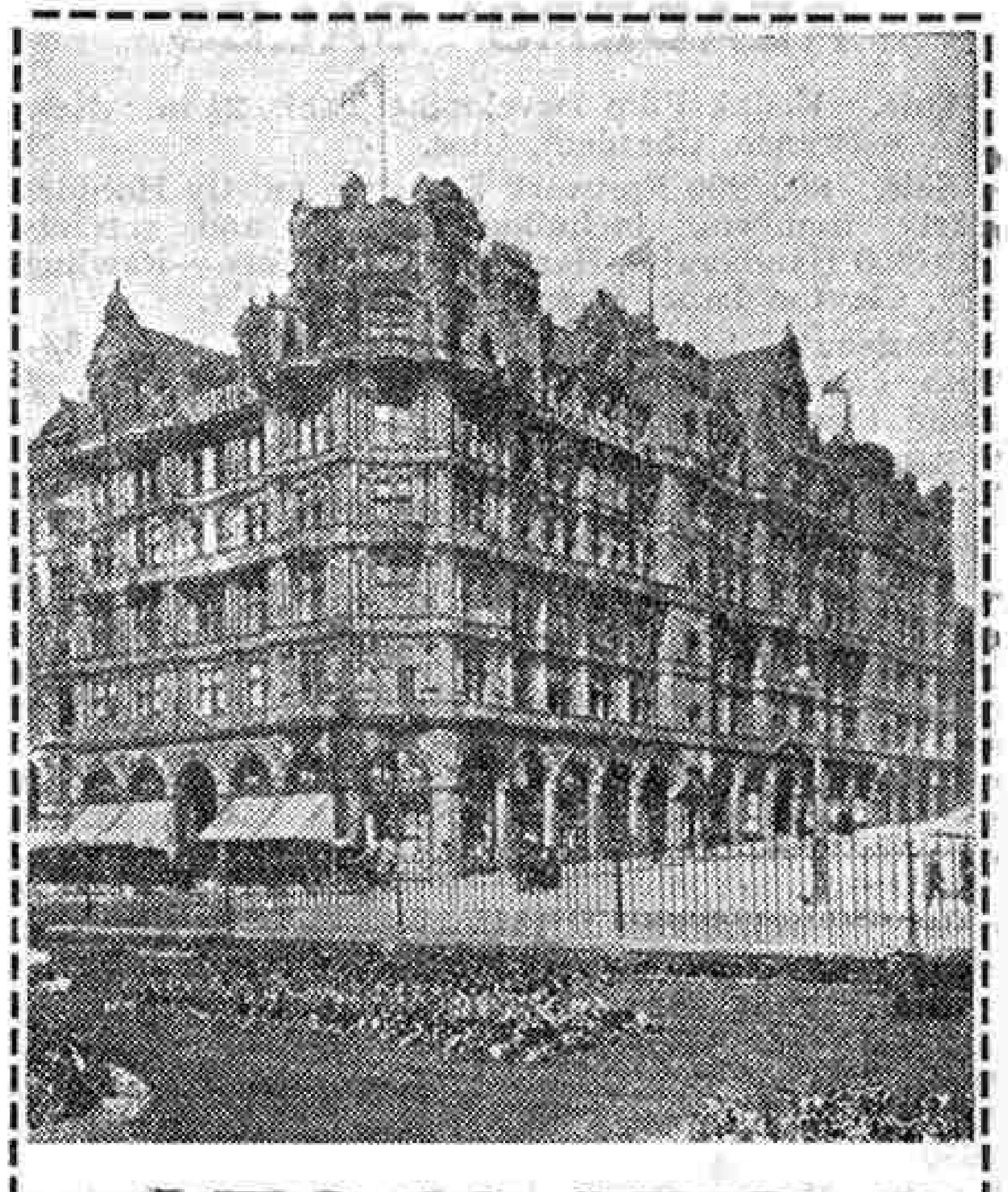

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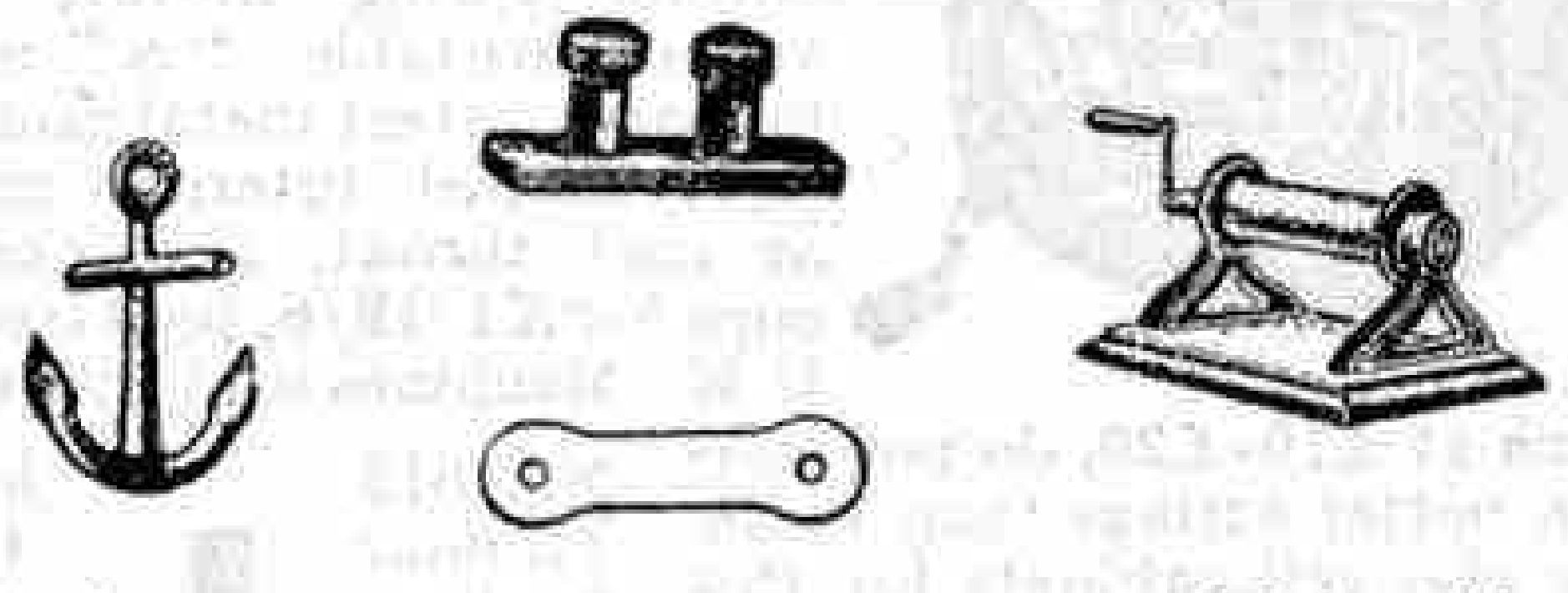

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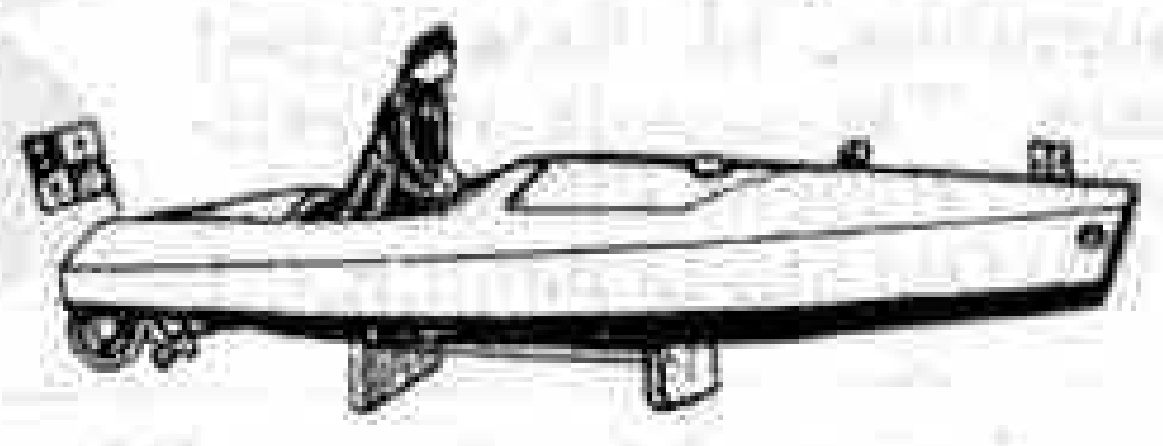

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The first correct entry received was from D. A. Packer, 8, Winchester Road, Andover, Hants., to whom an autographed copy of "*Engineering for Boys*" has been forwarded.

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RAILWAY PHOTOGRAPHS.

New L.N.E.R. & L.M.S. High-Pressure Locomotives, 6d. the pair, post free.

Send 4d. for specimen photograph and **new list M8, just published,** with over 50 new titles. All photographs post card size, 3d. each, 2/6 doz. post free.

Railway Photographs, 23, Hanover St., Liverpool.

Duke of York's Visit—(*Continued from page 547*)

parcels and cases are completed a slight push sends them sliding along on to a large transverse conveyor that carries them to the loading platform. This conveyor incorporates a weighing machine, and as the goods pass along they are accurately weighed and recorded. On reaching the loading platform they are loaded rapidly on to the firm's motor lorries and taken direct by road to their destination, or conveyed to the various railway stations and docks. At the time of the Duke's visit large cases of Meccano goods were being despatched for shipment to Australia and South Africa.

At this point time limitations brought the Royal tour to an end, and the party proceeded to the cars waiting at the entrance to the main office. At the same moment the factory siren was sounded and the 1,500 office and works employees were able at last to give vent to their feelings. There was a sudden rush to the various exits, and in a few seconds an enthusiastic army joined the crowd in the already packed street. The cars conveying the Duke and his party had the greatest difficulty in making a way through the cheering people in spite of the efforts of a large force of police.

Before the Duke left, Mr. Hornby asked him to accept a Hornby Train Set as a gift for Princess Elizabeth. His Royal Highness accepted it with a smile of pleasure. "She will be delighted with it," he said.

The day was a memorable one in the history of Meccano Limited, and the visit of the Duke of York will long be remembered.

MECCANO HEADPHONES

Meccano Headphones are British made and are of the highest quality procurable. They give loud, clear and undistorted reception and will add greatly to the efficiency of any wireless set. 4,000 ohms resistance.

Reduced Price 3/- per pair, post free.

Meccano Ltd., Old Swan, Liverpool.

MECCANO MAGAZINE

Registered at G.P.O., London, for transmission by Canadian Magazine Post.

EDITORIAL AND ADVERTISING OFFICE:—

OLD SWAN, LIVERPOOL, ENGLAND.

Telegrams: "Meccano, Liverpool."

Publication Date. The "*M.M.*" is published on the 1st of each month and may be ordered from any Meccano dealer, or from any bookstall or newsagent, price 6d. per copy. It will be mailed direct from this office, 4/- for six issues and 8/- for twelve issues.

To Contributors. The Editor will consider articles and photographs of general interest and payment will be made for those published. Whilst every care will be taken of articles, etc., submitted, the Editor cannot accept responsibility for any loss or damage. A stamped addressed envelope of the requisite size should be sent where the contribution is to be returned if unacceptable.

Readers' Sales and Wants. Private advertisements (i.e., not trade) are charged 1d. per word, minimum 1/-. Cash with order. Editorial and Advertising matters should not be dealt with on the same sheet of paper.

Advertisers are asked to note that private advertisements of goods manufactured by Meccano Limited cannot be accepted.

Small Advertisements. 1/6 per line (average seven words to the line), or 16/- per inch (average 12 lines to the inch). Cash with order.

Display. Quotations or space bookings, and latest net sale figures, will be sent on request.

Press Day, etc. Copy should be sent as early in the month as possible for insertion in following issue. We usually close for press on or before 6th of each month for following issue. Half-tone blocks up to 100 screen.

Proofs of advertisements will be sent when possible for space bookings of not less than half-an-inch

Voucher copies. Sent free to advertisers booking one inch or over. Other advertisers desiring vouchers should add 8d. to their remittance and should order voucher copy at same time.

Remittances. Postal Orders and Cheques should be made payable to Meccano Ltd.

Ordering the "M.M." Overseas

Readers Overseas and in foreign countries may order the "*Meccano Magazine*" from regular Meccano dealers or direct from this office. The price and subscription rates are as above, except in the cases of Australia, where the price is 1/5 per copy (postage extra), and the subscription rates 9/6 for six months and 19/- for 12 months (post free); Canada, where the price is 15c. per copy, and the subscription rates 75c. for six months, and $1.50 for 12 months (post free).

The U.S.A. price is 15c. per copy, and the subscription rates $1 and $2 for 6 and 12 months respectively (post free).

Overseas readers are reminded tha the prices shown throughout the "*M.M.*" are those relating to the home market. Current Overseas Price Lists of Meccano Products will be mailed free on request to any of the undermentioned agencies. Prices of other goods advertised may be obtained direct from the firms concerned

CANADA: Meccano Ltd., 34, St. Patrick St., Toronto.
UNITED STATES: Meccano Co. of America Inc., New Haven, Conn. Meccano Co. of America Inc., 200, Fifth Av., New York.
AUSTRALIA Messrs. E. G. Page & Co., 52, Clarence Street, Sydney, N.S.W.
NEW ZEALAND: Models Ltd., Kingston & Federal Streets, Auckland.
SOUTH AFRICA: Mr. A. E. Harris (P.O. Box 1199), 142, Marke Street, Johannesburg.
INDIA: Karachi: Bombay Sports Depot, Elphinstone Street, Bombay; Bombay Sports Depot, Dhobi Talao. Calcutta: Bombay Sports Depot, 13/C, Old Court House Street.

The Editor wishes to make known the fact that it is not necessary for any reader to pay more than the published price. Anyone who is being overcharged should lodge a complaint with the Meccano agent in his country or write direct to the Editor.

BOYS MAKE YOUR OWN LEAD SOLDIERS
Cowboys, Indians, Animals, Zulus, Model Farmyard Sets, Rodeo, etc. Our CASTING MOULDS make thousands from any scrap lead WITHOUT PREVIOUS EXPERIENCE. Send stamp to-day for Illustrated Catalogue. Complete mould ready for work **2/6.—"TOYMOULDS," 67, Stafford Street, Birmingham.**
"*Mention Meccano.*"

MECCANO

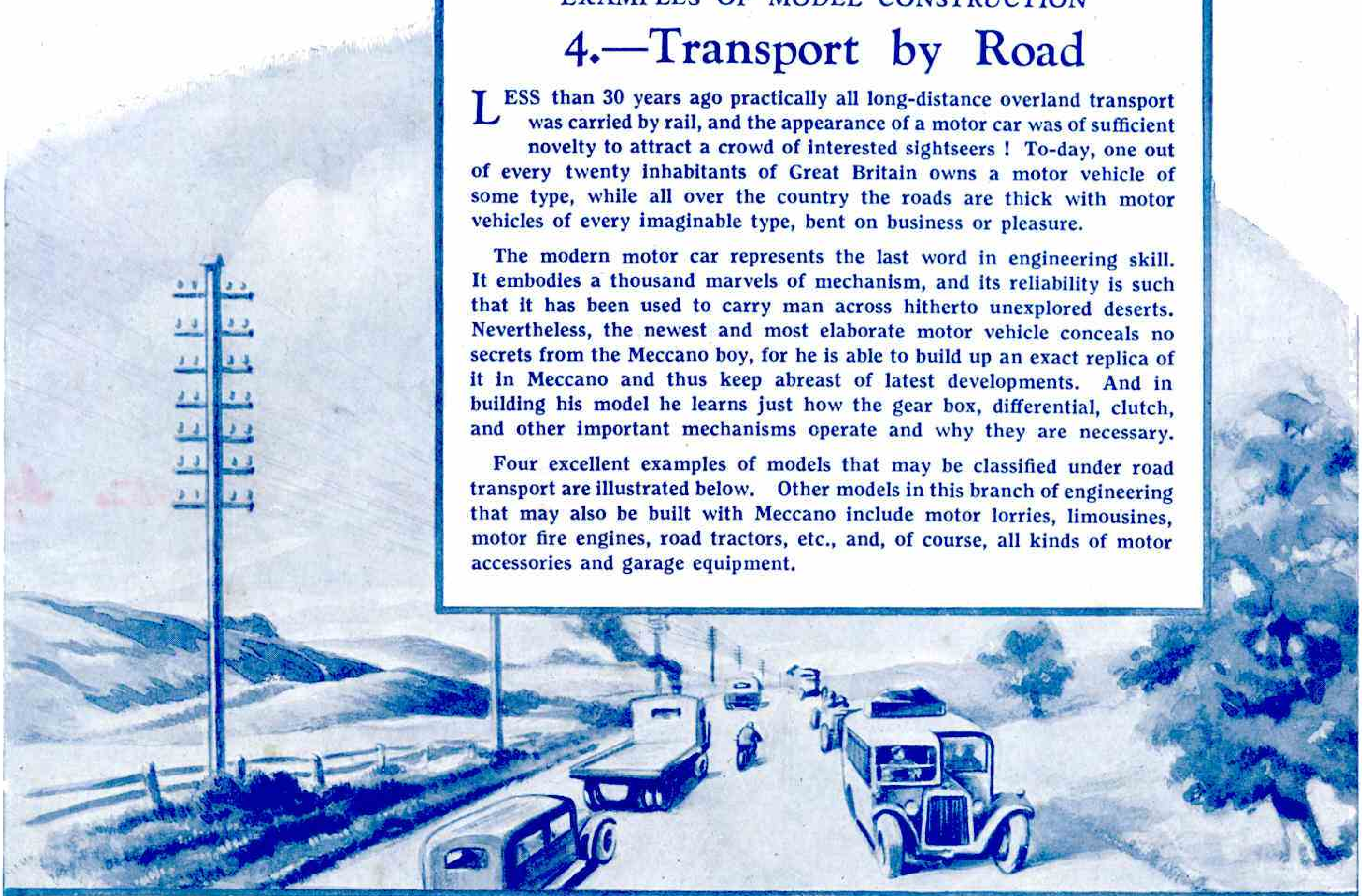
EXAMPLES OF MODEL CONSTRUCTION

4.—Transport by Road

LESS than 30 years ago practically all long-distance overland transport was carried by rail, and the appearance of a motor car was of sufficient novelty to attract a crowd of interested sightseers ! To-day, one out of every twenty inhabitants of Great Britain owns a motor vehicle of some type, while all over the country the roads are thick with motor vehicles of every imaginable type, bent on business or pleasure.

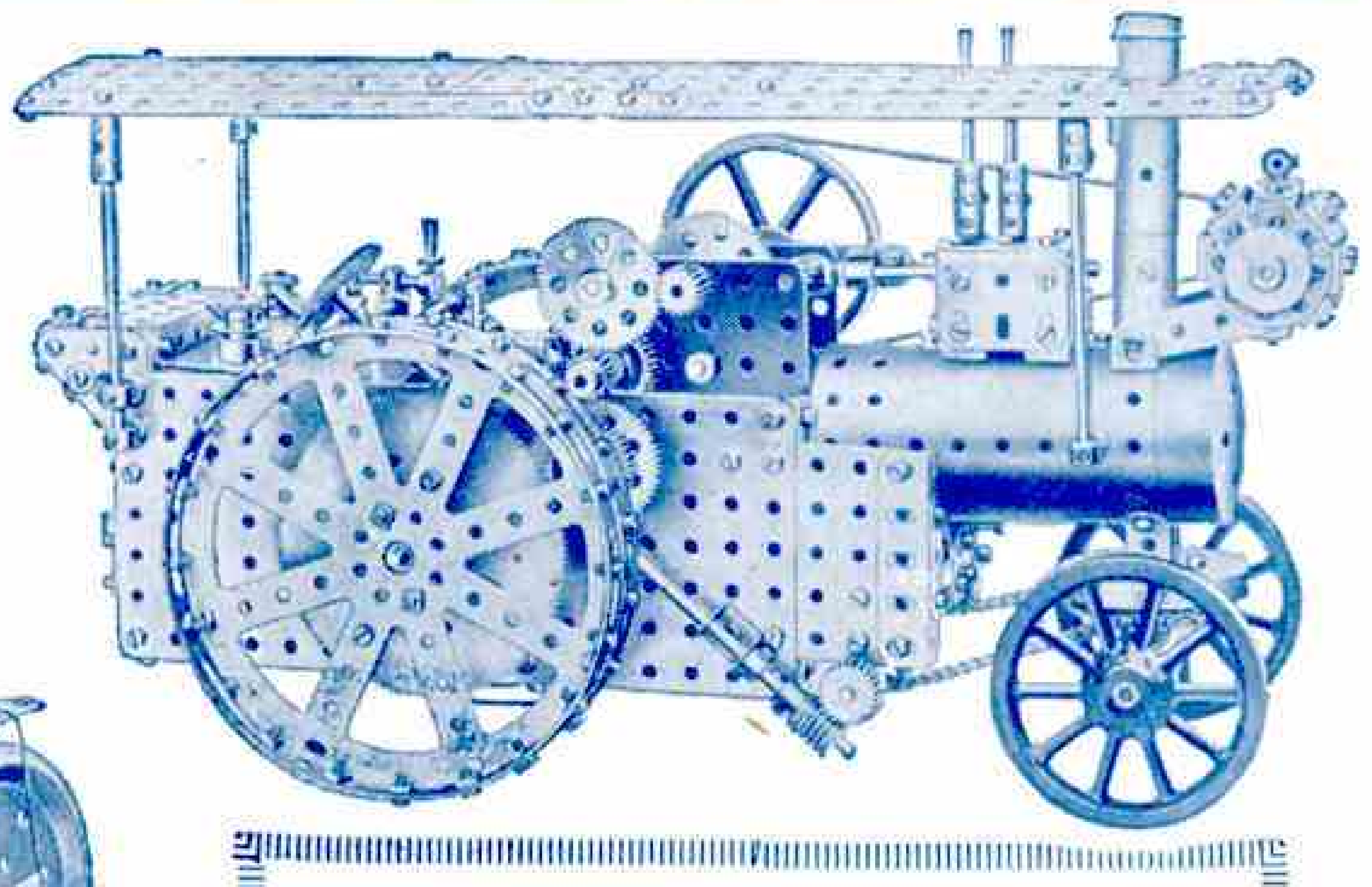
The modern motor car represents the last word in engineering skill. It embodies a thousand marvels of mechanism, and its reliability is such that it has been used to carry man across hitherto unexplored deserts. Nevertheless, the newest and most elaborate motor vehicle conceals no secrets from the Meccano boy, for he is able to build up an exact replica of it in Meccano and thus keep abreast of latest developments. And in building his model he learns just how the gear box, differential, clutch, and other important mechanisms operate and why they are necessary.

Four excellent examples of models that may be classified under road transport are illustrated below. Other models in this branch of engineering that may also be built with Meccano include motor lorries, limousines, motor fire engines, road tractors, etc., and, of course, all kinds of motor accessories and garage equipment.



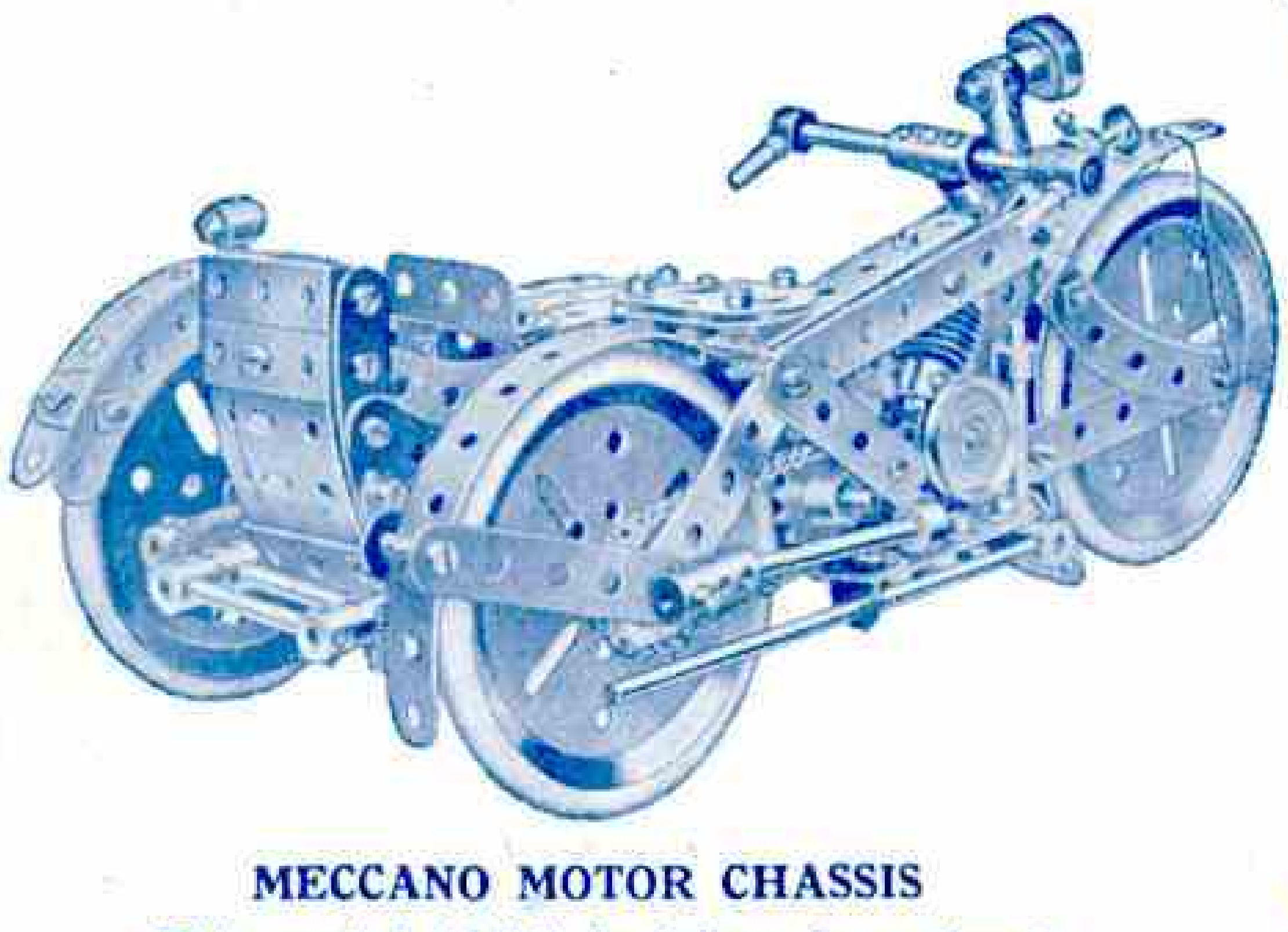
MECCANO MOTOR CYCLE AND SIDECAR

The Meccano Motor Cycle (below) incorporates head and side lamps, sprung saddle, exhaust pipes, chain drive, Klaxon horn, luggage carrier, etc while the sidecar, which is of graceful streamline design, is mounted on springs. The twin-cylinder engine is composed primarily of two Worms. See Instruction Leaflet No. 3 (Price 2d. post free).



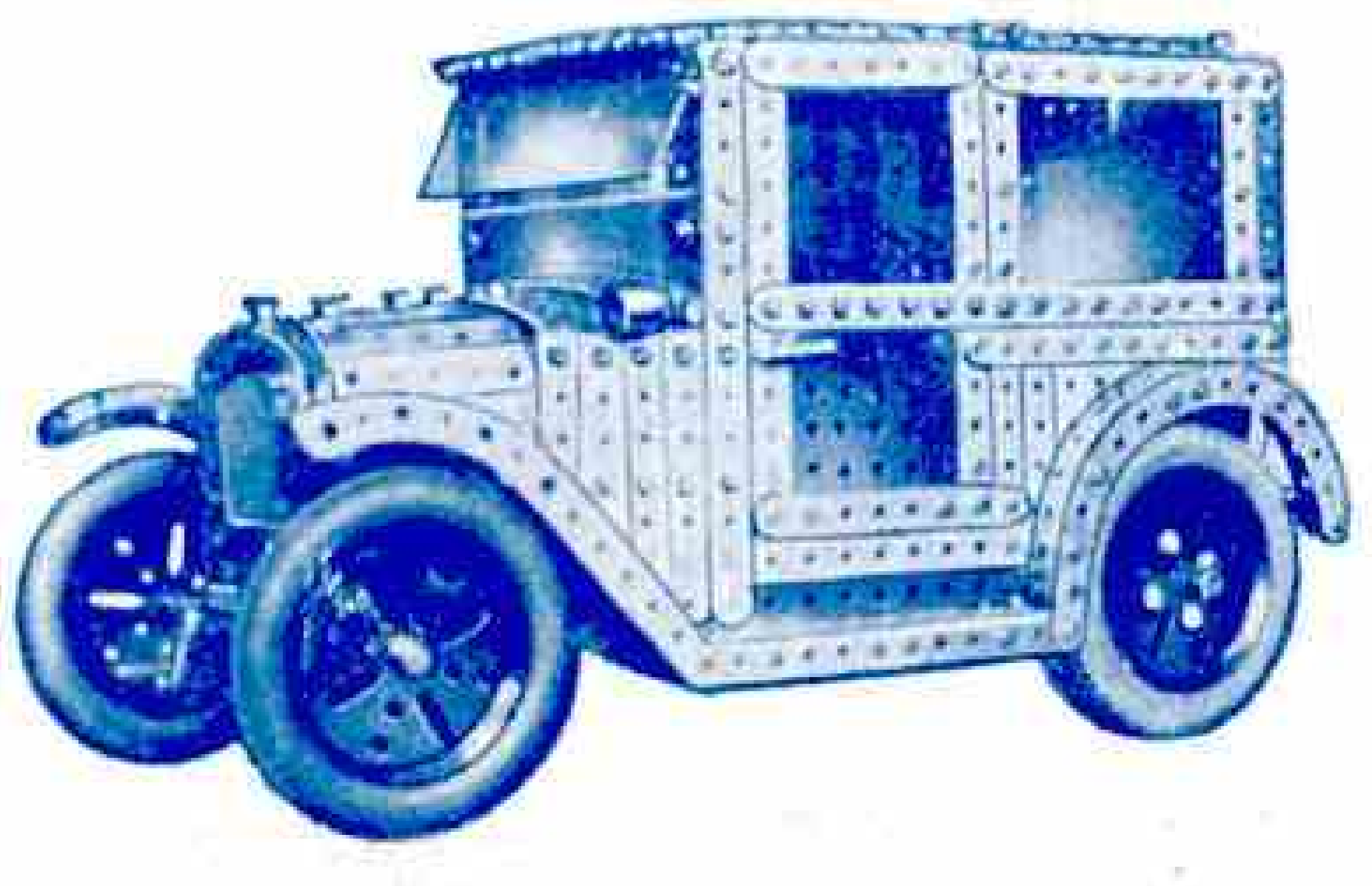
MECCANO TRACTION ENGINE

Driven by a Meccano 6-volt Motor, which is mounted in the space occupied by the firebox in the prototype, the Traction Engine (left) will easily haul a boy of average weight. It is fitted with two-speeds forward and reverse controls, worm and chain steering gear, and brake. For detailed illustrations and complete instructions for building, see Special Instruction Leaflet No. 22 (Price 2d. post free).



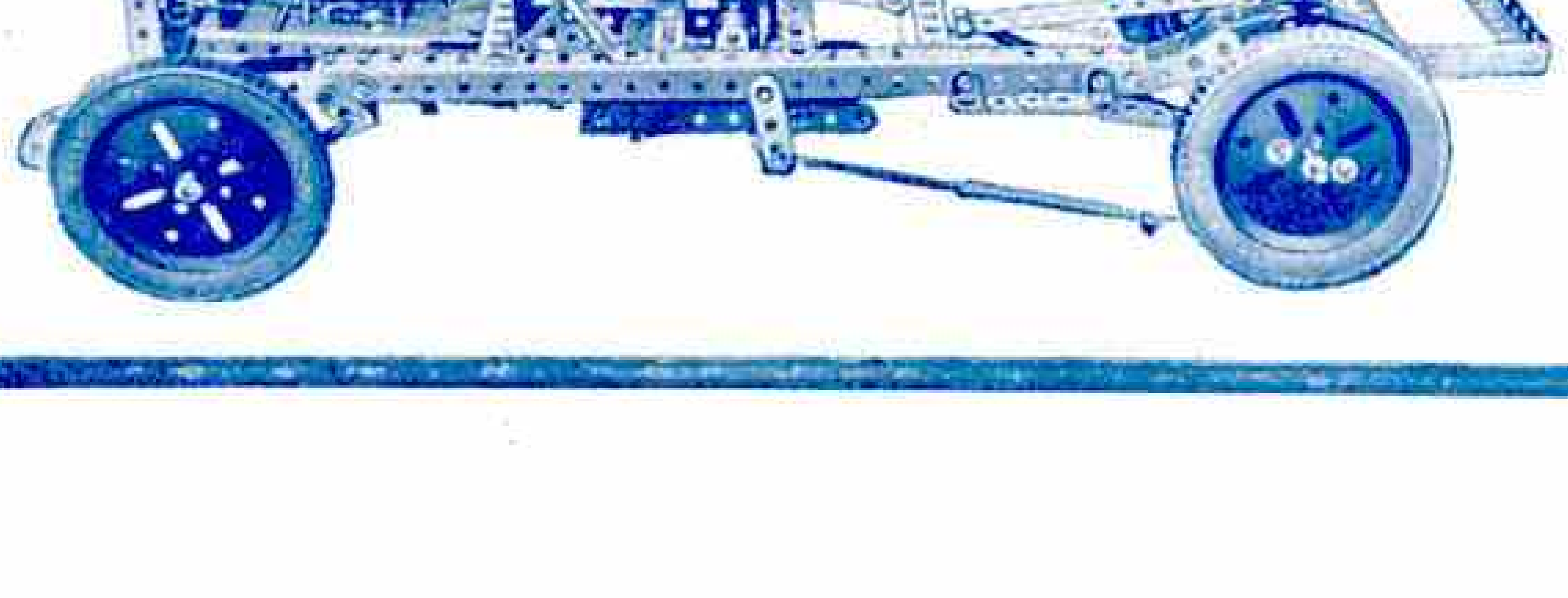
Meccano Outfits range in price from 2/- to 450/-, and may be obtained from all leading toy stores. Ask to see them.

MECCANO LTD.
Old Swan, LIVERPOOL



MECCANO MOTOR CHASSIS

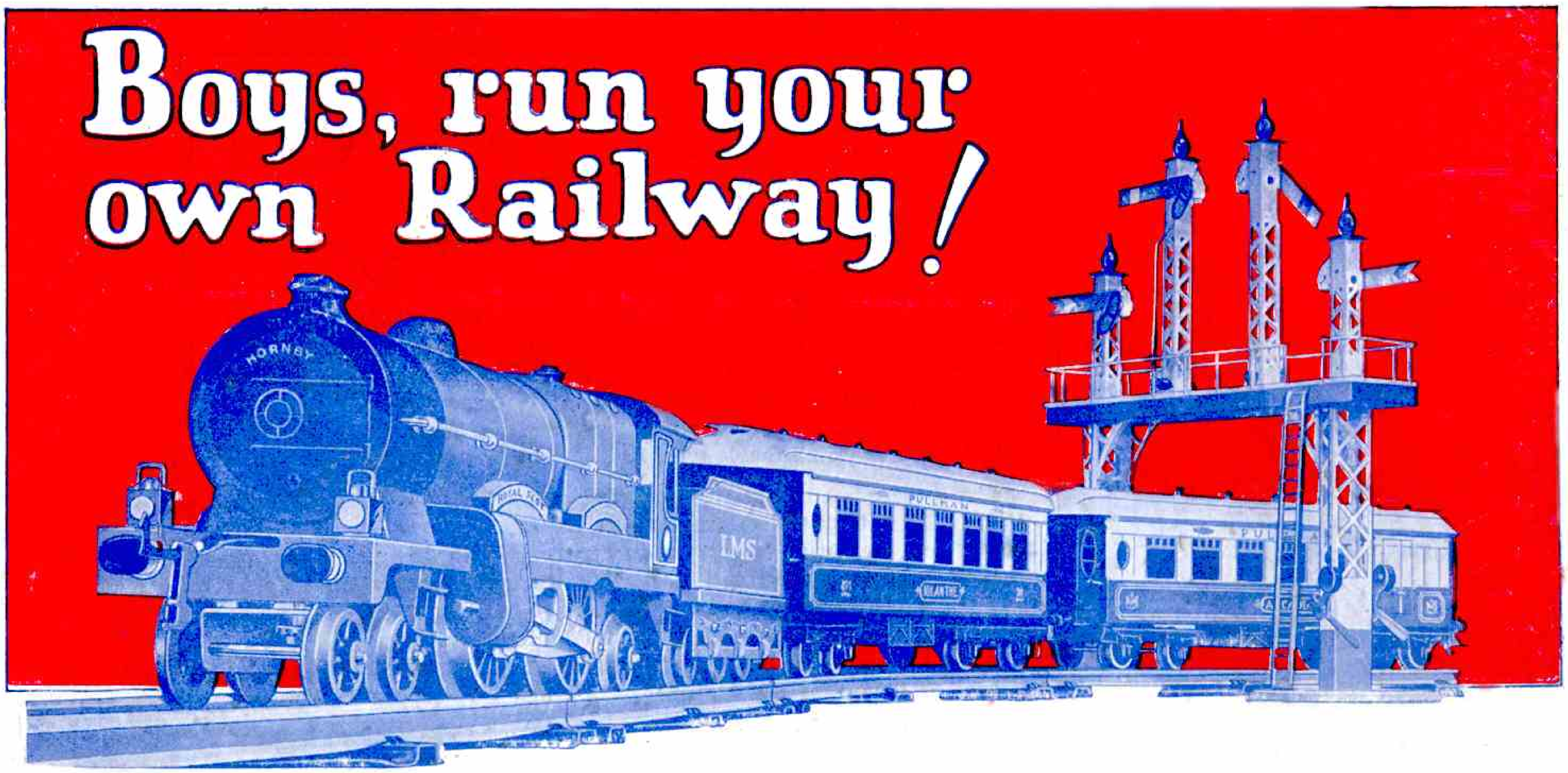
This model (right) is driven by a 6-volt Electric Motor and includes a gear box, clutch, differential, laminated springs, Ackermann steering, torque rods, etc. Full instructions for building the model are contained in Special Instruction Leaflet No. 1. (Price 3d. post free).

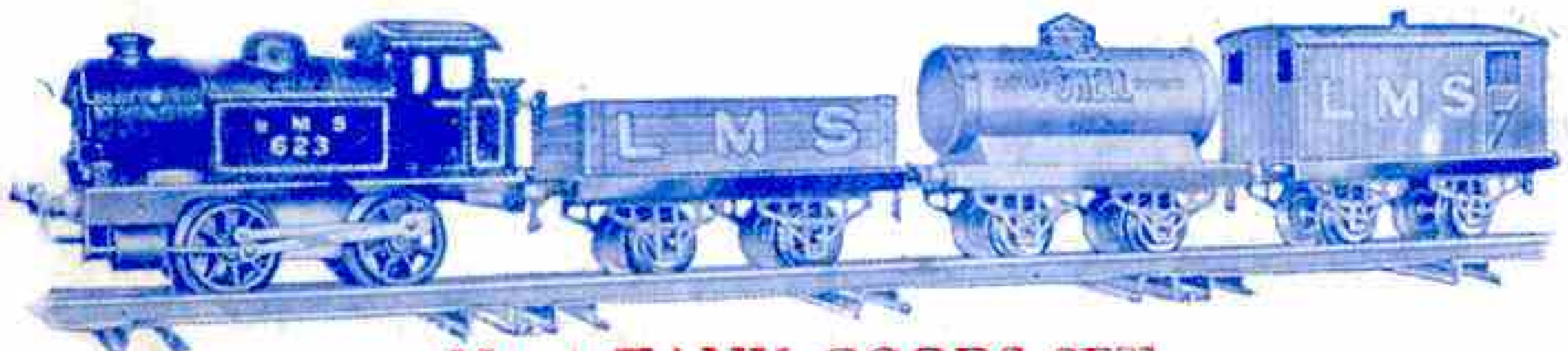


MECCANO MOTOR CAR

The model shown above is of a "baby" car of a well-known make. It is built entirely from standard parts with the exception of the windscreen and windows. The model is complete with steering gear and if desired may be driven by a Meccano Clockwork or Electric Motor.

Boys, run your own Railway!

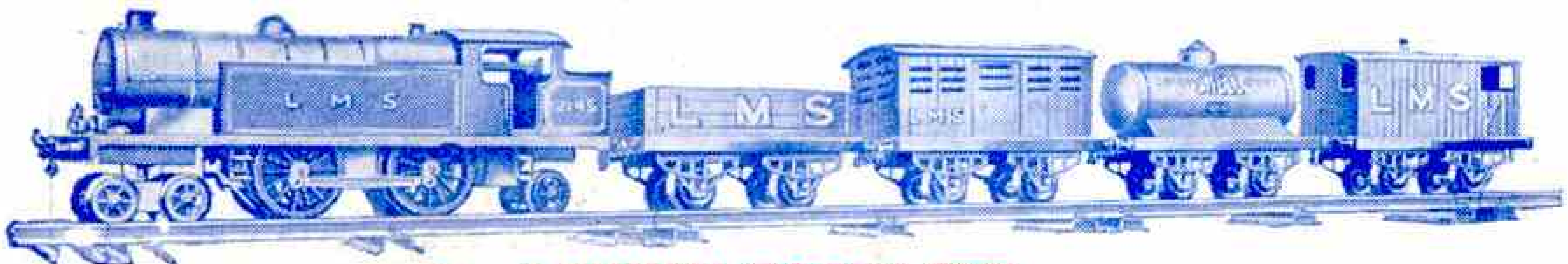




No. 1 TANK GOODS SET

No. 1 SPECIAL PASSENGER SET

No. 1 SPECIAL GOODS SET



No. 2 MIXED GOODS SET

No. 2 SPECIAL PULLMAN SET

When you have a Hornby Train, with Hornby Rolling Stock and Accessories, you can enjoy the splendid fun of running your own complete railway system. Its the finest fun in the world, and so fascinating that even Dad will want to take part in the operations when you have fixed up and completed your railway system!

See how long a Hornby Locomotive runs without re-winding. See how it gets up speed with a heavy load behind it, and how smoothly it rides over Points and Crossings. And how fine and sturdily-built are Hornby Trains. How real they look. How beautifully they are enamelled in the correct railway colours. Every part of a Hornby railway is like that—strong and beautifully finished. Ask your dealer to show you samples.

PRICE LIST

CLOCKWORK TRAIN SETS

M0 Passenger Set	6/-
M1 Passenger Set	7/6
M Goods Set	8/6
M2 Passenger Set	9/-
No. 0 Goods Set	15/-
No. 0 Passenger Set	15/-
No. 1 Goods Set	20/-
No. 1 Tank Goods Set	22/6
No. 1 Passenger Set	25/-
No. 1 Special Goods Set...	32/6
No. 1 Special Passenger Set	35/-
No. 2 Mixed Goods Set	40/-
Metropolitan Train Set C	55/-
No. 3C Train Set "Riviera Blue"	62/6
No. 2 Special Pullman Set	67/6
No. 3C Train Sets, "Flying Scotsman," "Royal Scot," "Cornish Riviera," or "Continental Express"	67/6

ELECTRIC TRAIN SETS

No. 3E Train Set "Riviera Blue" (6-volt) ...	80/-
No. 3E Train Sets (6-volt), "Flying Scotsman," "Royal Scot," "Cornish Riviera," or "Continental Express"	85/-
Metropolitan Train Set L.V. (6-volt)	95/-

HORNBY TRAINS

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